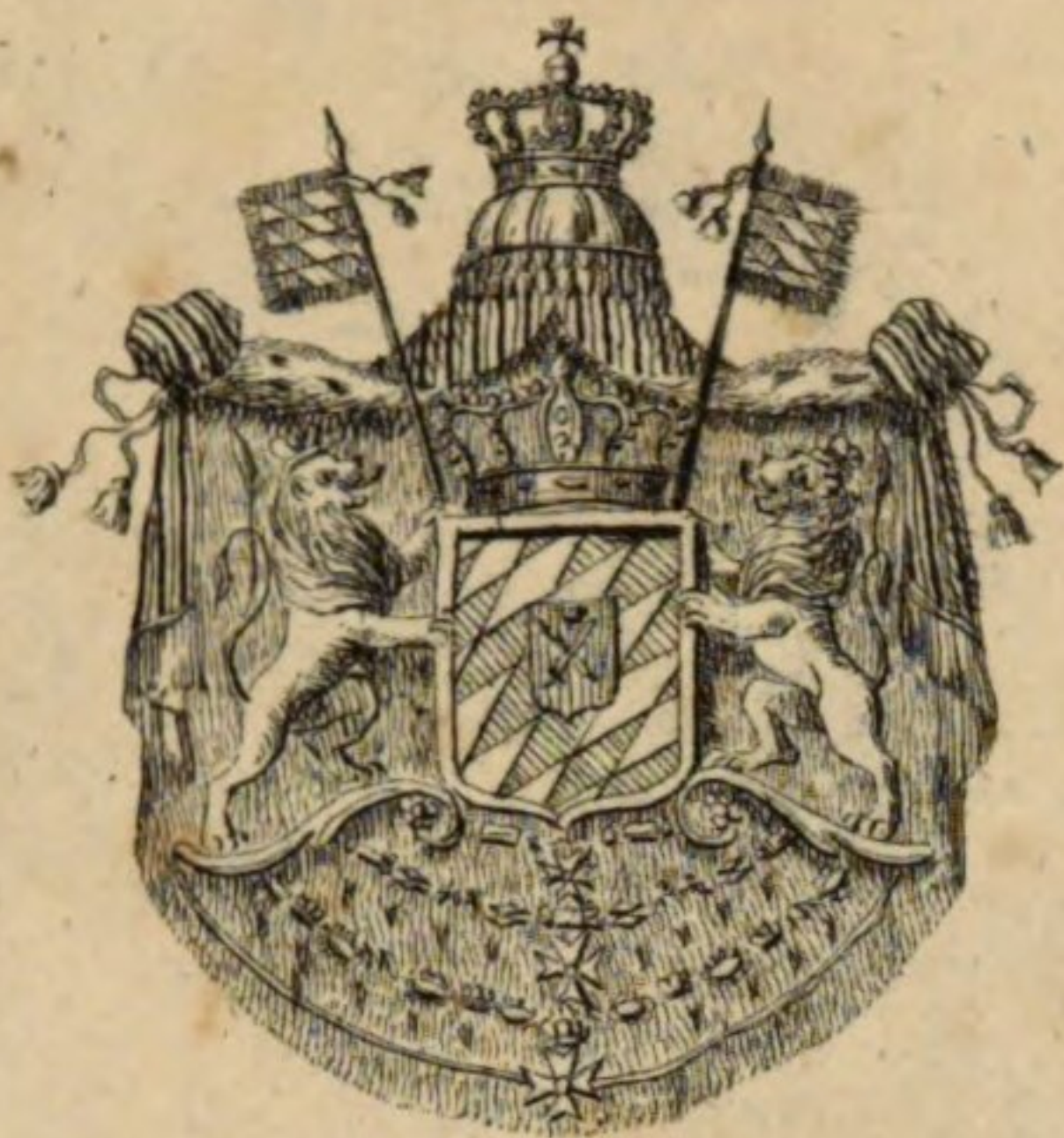
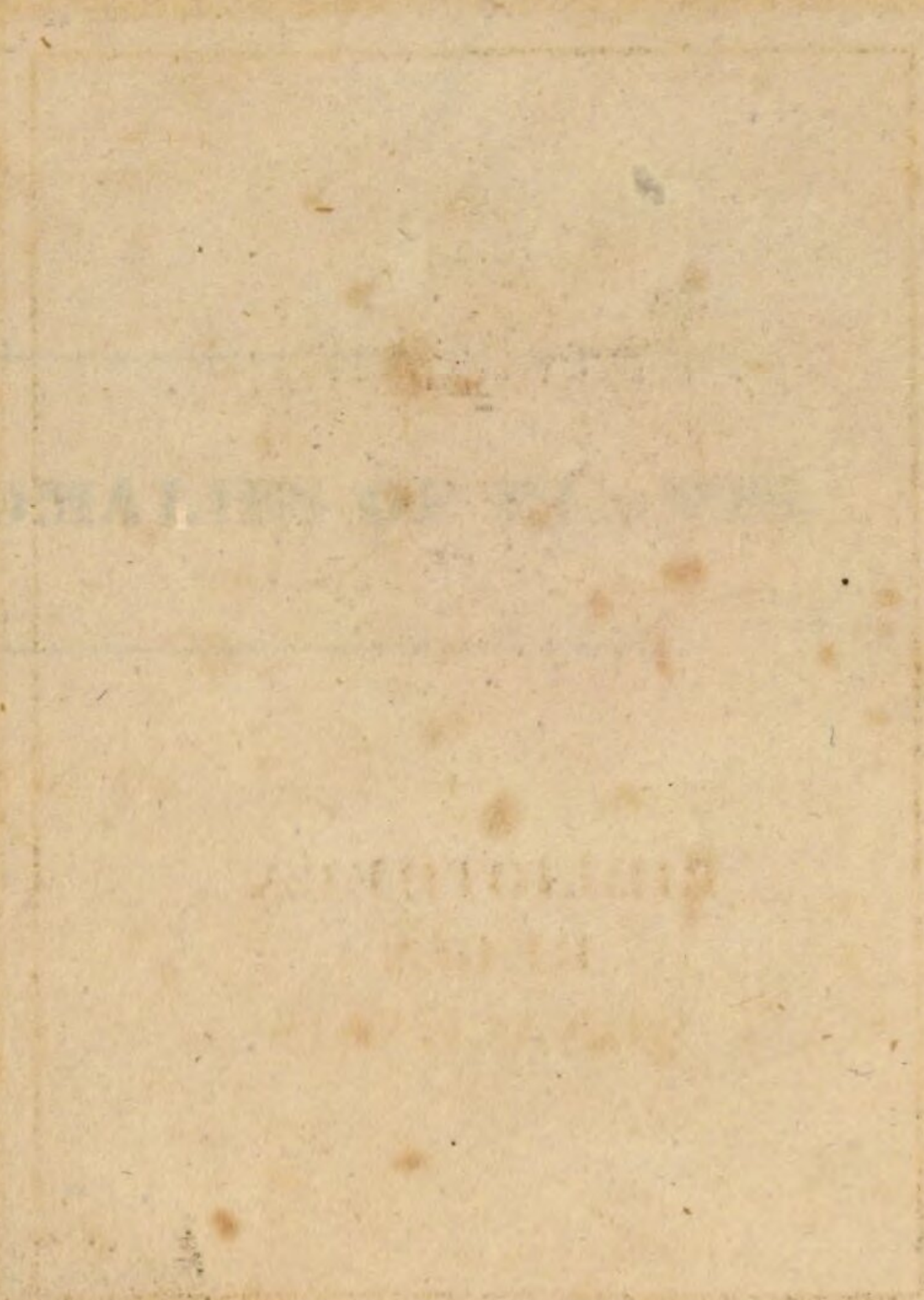




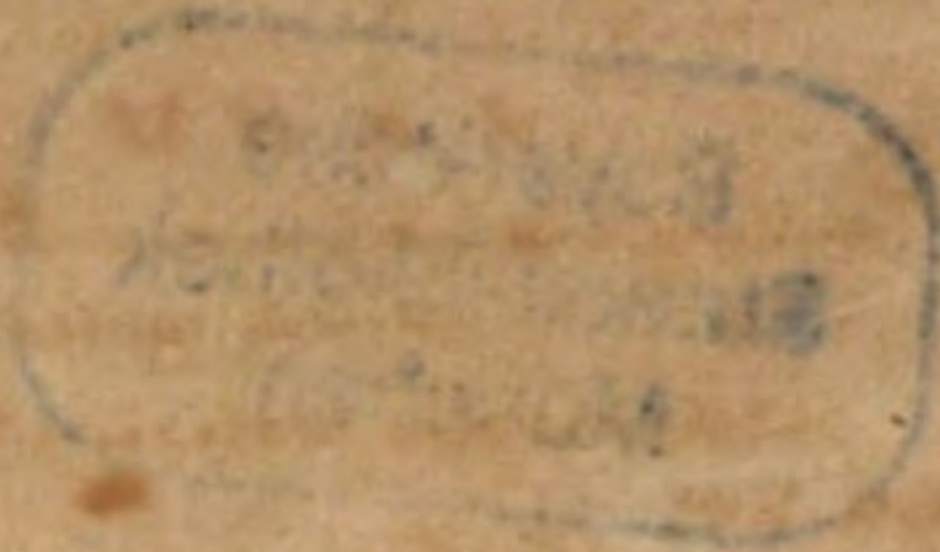
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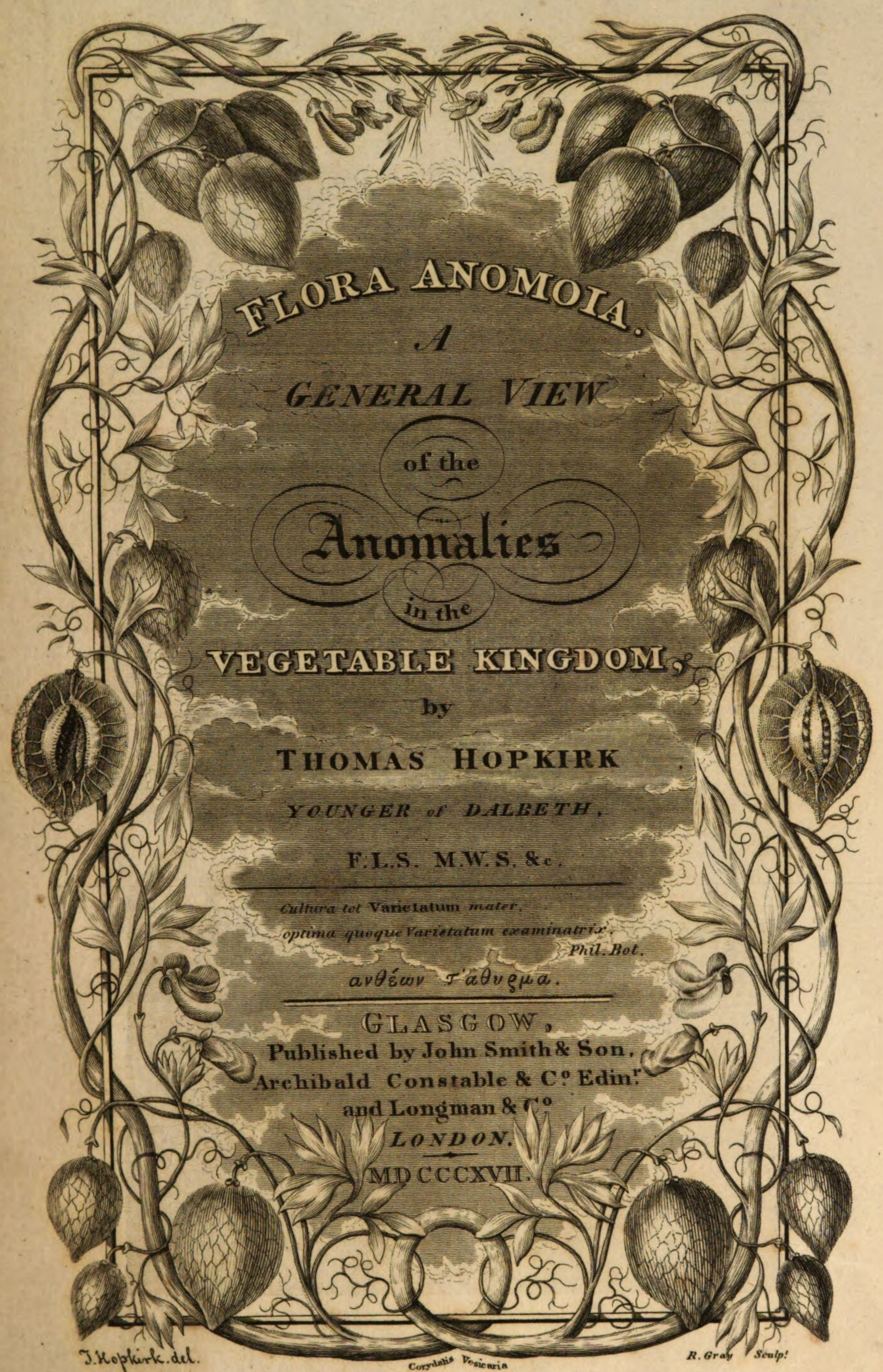
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FLORA ANOMOIA.

A

GENERAL VIEW

of the

Anomalies

in the

VEGETABLE KINGDOM,

by

THOMAS HOPKIRK

YOUNGER of DALBETH.

F.L.S. M.W.S. &c.

Cultura tot Varietatum mater,

optima quoque Varietatum examinatrix.

Phil. Bot.

ανθέων τ' ἀθύρμα.

GLASGOW,

Published by John Smith & Son,

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and Longman & Co

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MDCCCXVII.

J. Hopkirk. del.

Corydalis Vesicaria

R. Gray Sculp!

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TO
LADY LISTON,
THE
Following Pages
ARE
Most Respectfully Inscribed,
BY
HER LADYSHIP'S
MOST OBEDIENT HUMBLE SERVANT,
THE AUTHOR.

DALBETH, December 1816.

INTRODUCTION.

BOTANY is that science which enables us to distinguish different plants from one another, and to gain a knowledge of their properties and uses; for the more easy attainment of which objects, Naturalists have divided vegetables into **CLASSES** and **ORDERS**, and these again into **GENERA** and **SPECIES**, from a certain analogy in their appearance.

A **GENUS** is a number of plants agreeing with one another in the structure of the flowers and fruit, in some essential character, and each of the plants composing this genus is a **Species**.

The **SPECIES** is composed of a succession of individuals springing from one another, by a direct and constant generation *by seed**.

* Or by a separation of their parts, according to some authors, but the continuation by seed, is perhaps the only true mark of the **Species**.

Amongst the modifications to which these individuals are subject, some produce their likeness constantly, and others for a longer or shorter time, the latter are called by Naturalists, Varieties.

A VARIETY, therefore, is a deviation from the common or natural appearance of a plant, caused by some accidental circumstance, which being removed, it again assumes its original figure *.

In general Varieties do not exist long, the modifications which have separated them being produced by accident, sooner or later disappear, and the characteristic form of the species alone remains, but when these modifications become permanent, and are constantly renewed *by seed*, the variety ought then to constitute a species.

The greater proportion of the plants which cover the earth, are probably original, that is, have undergone no change in their form either from accident, or by crosses with other species, but many which are

* Varietates sunt Plantæ ejusdem speciei, mutatæ a causa quacunque occasionali. Phil. Bot.

now considered as such, have no doubt been originally produced by these causes, especially the latter, and that vegetable hybrids are frequently prolific, and even continue to produce their likeness for a great length of time, cannot be denied, after the many instances known, and experiments made on this subject.

Varieties, have been but little attended to by Botanists *, who have in general contented themselves, with simply taking notice of them when remarkable; to the Horticulturist we are indebted for their enumeration and cultivation, as objects of interest to him, from their beauty or usefulness.

To the Physiologist the anomalies in the vegetable world ought to be more peculiarly interesting, as an attentive examination of them, and the structure of their vessels, and a comparison with the natural plant, might not only tend to point out the causes of their production, at present unknown, but might contribute greatly to

* *Varietates levissemas non curat Botanicus.* Phil. Bot.

the advancement of Physiological Botany in other respects.

The present publication is intended to exhibit in one view, the anomalies which take place amongst vegetables, by collecting together such as are recorded, or have come under the author's own observation. They are arranged under four general heads, viz. The Anomalies of the Root, of the Stem and Branches, of the Leaf, and of the Flower, including its separate parts, and the fruit. Of the different anomalies that these are liable to, such examples are given as may be familiar to every person at all conversant with plants, without at the same time omitting any that are more uncommon.

To the Horticulturist and the Botanist, it is presumed that it may be interesting, to the former, by the enumeration of the many varieties daily presented to him, and to the latter, by exhibiting those anomalous forms in plants, which are so apt to mislead him at the commencement of his studies.

A few plates are given to illustrate the subject, which claim no farther merit, than

being tolerably faithful representations of the subjects from which they are taken. To avoid the constant references which would otherwise be necessary, a list of the works consulted is inserted, and to them the reader is referred, who wishes to go farther into the subject, than the limits or plan of the present publication will admit.

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DESCRIPTION OF PLATES.

SURROUNDING the Title Page is the *Corydalis vesicaria*, with its bladder-like capsules, two of them open to show the disposition of the seed.

Plate I. Part of the stem of the *Impatiens noli tangere*, broken at *c*; *a*, the old roots; *b, b, b*, new roots that have pushed out, to supply the plant with nourishment imperfectly afforded by the roots *a*.

Fig. 2. a root of the same plant that grew in water, showing the greater extension and division which it acquires.

Plate II. Impressions taken from the leaves of the variety of the Common Beech, called the Fern-leaved Beech, with the various appearances of the leaves in attempting to regain their natural shape.

Plate III. Fig. 1. a frond of the curled variety of the Hound's Tongue, (*Scolopendrium officinarum*.)

Fig. 2. the branched variety of the same plant.

Plate IV. A plant of *Convolvulus tricolor*, with variegated flowers; *a*, the natural appearance; *b*, a variegated or striped flower; *c*, a flower losing the

stripes, and becoming altogether white; *d*, a curious variety in which the flower is blotched with white. Although represented in the plate on the same plant with the others, it grew on a separate one.

Plate V. Fig. 1. a flower of *Calla palustris*, of the natural appearance.

Fig. 2. the same plant with a double spathe; *b*, roots that grew in earth; *c*, roots that grew in water.

Plate VI. Fig. 1. a plant of Feverfew, (*Pyrethrum parthenium*,) *a*, a flower with the tubular florets in the disc increased, to the exclusion of the ligulate ones in the ray; *b*, a flower with the ligulate ones increased to the exclusion of the tubular ones; *c*, a natural flower.

Fig. 2. a flower of *Chrysanthemum leucanthemum*, with irregular ligulate florets *a*, growing from amongst the tubular ones; *b*, the regular ligulate florets.

Fig. 3. *Senecio elegans*; *a*, a natural flower; *b*, a full flower.

Fig. 4. a flower of *Bellis perennis*, with the ligulate florets increased, but not to the entire exclusion of the tubular ones.

Plate VII. Fig. 1. Two flowers of *Antirrhinum majus*, *a*, the regular flower; *b*, a monstrous one, the petal being laciniated and irregularly twisted.

Fig. 2. *a*, the natural flower of *Antirrhinum linaria*; *b*, and *c*, the variety called Peloria.

Fig. 3. *a*, the natural flower of *Antirrhinum repens*; *b*, a flower with two additional nectaries.

Fig. 4. a plant of *Ophioglossum vulgare*, with a double spike.

Fig. 5. a leaf with the midrib unnaturally divided.

Fig. 6. a leaf which from the unnatural division of the midrib and the double apex, has the appearance of being double.

Plate VIII. Fig. 1. Petal of the Parrot Tulip, with two spurious corniculated nectaries, *a, a*, attached to it.

Fig. 2. Multiplied nectaries of Columbine enclosed one within another.

Fig. 3. A spurious nectary attached to the anther of the Columbine.

Fig. 4. *Aira flexuosa*; *a*, the natural floret; *b*, a viviparous one; *c*, a viviparous floret detached.

Plate IX. Fig. 1. A proliferous Rose having a stalk with a small Rose rising from the centre of the natural one; *a*, spurious bracteæ surrounding the proliferous stem.

Fig. 2. a proliferous Rose, where a stem with leaves proceeds from the centre of the Rose; *b*, the receptacle after the petals have fallen off.

Plate X. Fig. 1. a variety of *Plantago major*, with leaves on the stem.

Fig. 2. The proliferous variety of *Plantago lanceolata*.

Fig. 3. a variety of *Plantago maritima*, with leaves growing from the flower-spike; *a*, a portion which has taken root in the ground.

Plate XI. Fig. 1. An Oak branch, with a gall on the branch, *a*; *b*, the insects which proceed from it; *c* and *d*, different galls formed on the leaves.

Fig. 2. the leaf of the Alder covered with irregular galls.

Fig. 3. *a*, galls formed upon the leaf of the Willow.

Fig. 4. *Veronica chamædrys*, the upper leaves disfigured by insects; *a*, the natural size of the small worms that inhabit them; *b*, the magnified appearance.

ANOMALIES OF PLANTS.

SECTION I.

ANOMALIES OF THE ROOT.

THE root is that part of a plant by which it draws its principal supply of nourishment, and is the most important part of its structure, in as much as it is essential to its growth at first, and its existence throughout.

All vegetables are furnished with roots, and for the most part these are fixed in the earth, but there are several exceptions from this, some plants existing entirely in water, as the Duck Weeds, (*Lemnæ*) *Salvinia*

natans, and many of the Sea Weeds, or Fuci, as *Fucus natans*; and others are parasitical, that is, are attached to other substances generally vegetables, as many of the Lichens and Mosses, the Dodder, (*Cuscuta*,) and Misseltoe, (*Viscum*.)

In these, the roots are formed with vessels capable of drawing nourishment from the various substances on which they are placed. The Dodder germinates at first in the earth, and pushing up its stem, lays hold of and twists round, some neighbouring plant of Flax, Thyme, Nettle, or Heath. Several little roots or knobs are then protruded from its stem, which insert themselves into the bark of the plant that supports it, and the root in the earth decaying, it draws its nourishment solely from those in the vegetable on which it grows. In this case, it has only exchanged one kind of root for another; it does not become a part of the plant upon which it grows, but remains perfectly distinct, and can be easily separated from it.

Mr. Decandolle placed a branch of an Apple Tree upon which grew a stalk of

Misseltoe, in an infusion of Cochineal, for five days; he then dissected it, and observed the coloured liquor to have arisen through the wood and alburnum of the apple branch, and reached the place of junction between it and the Misseltoe. There did not appear, however, to be the slightest anastomosis between the vessels of the different plants; but at the base of the Misseltoe, where the parts were deeply reddened, a minute cellular structure was observed; into these cells, the vascular system of the Apple Tree seemed to deposit its sap, and from them, the capillary absorbents of the Misseltoe distributed upon the cells, seemed like the *ordinary absorbents of the root*, to take it up.

When the Misseltoe, says Mirbel, gains footing upon a branch, its roots extend in the liber, which is renewed annually; when this liber becomes hardened, and changes to wood, new roots appear above the old ones, which pierce the new liber formed above the old; and this takes place as long as the plant exists. Frequently the Misseltoe may be perceived to have fastened

its roots at a considerable distance from where the seed or berry was dropped. It pushes out its fibres between the wood and bark, till it finds a suitable situation to insert its roots, and there it makes its way through the bark. This is analogous to the choice of soil, so frequently observed in plants growing in the earth.

In the process of grafting, nearly the same thing takes place. The graft inserted into the stock, assumes, from necessity a new kind of root, calculated to draw nourishment from the tree upon which it is placed; but it never becomes part of the stock, or anastomoses with it.

THE root, from being generally covered, is less exposed, than the other parts of a plant, to accidental variation.

A greater or less degree of moisture, is the cause of many of the anomalies observed in roots. If the root of a plant is accidentally immersed in water, a remarkable change takes place. The woody and solid part of it becomes divided into many fibres, and these again are subdivided into

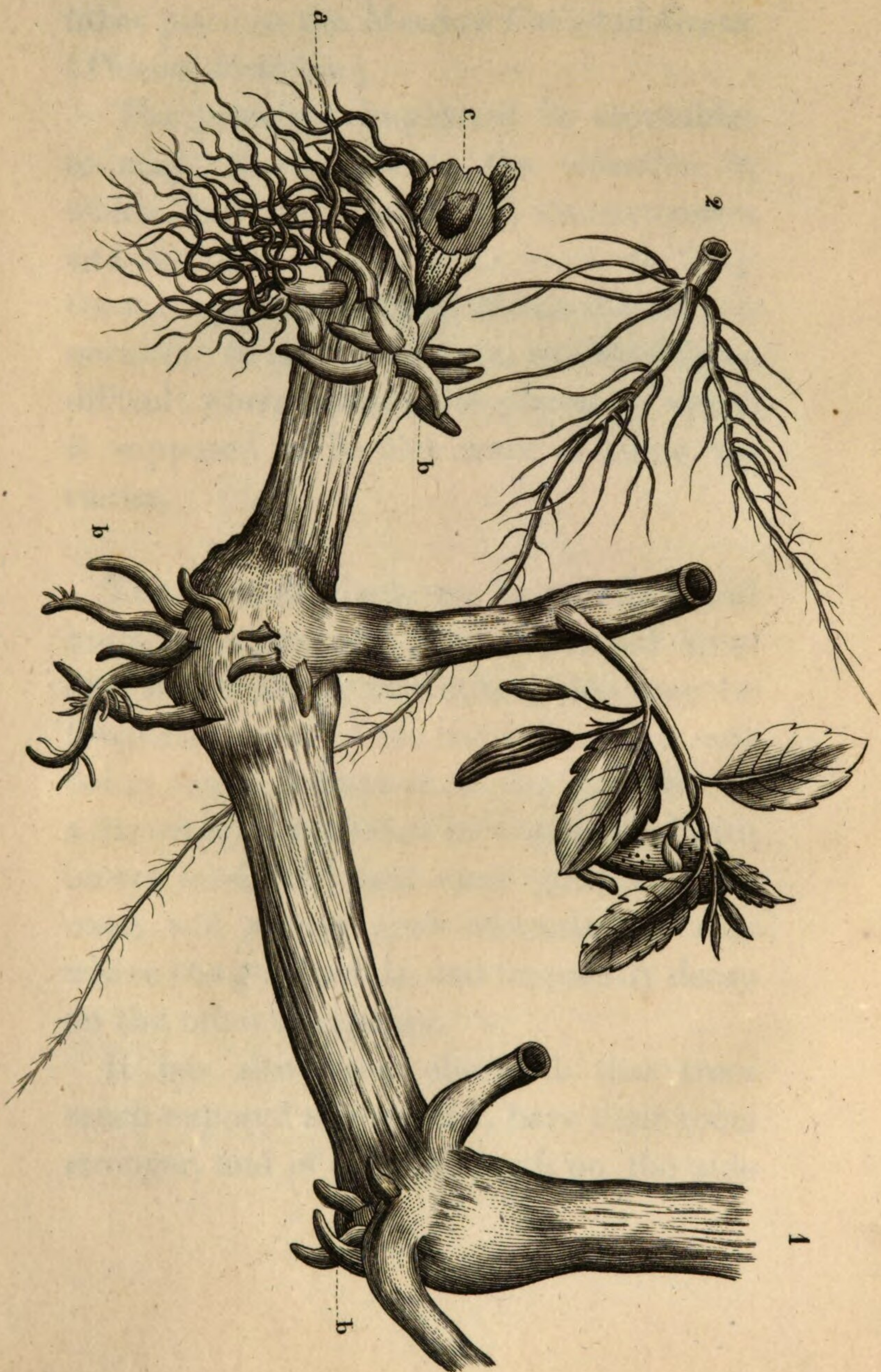
numerous others, giving the whole a very different appearance from its natural one. This is frequently seen in Willows growing near water, whose roots have penetrated through the bank; it is also very conspicuous in the Water Hemlock, or Cowbane, (*Cicuta virosa*), so frequent on the sides of lochs, in the vicinity of Glasgow; the banks of which, when the water is low, may be seen covered with the long capillary fibres of that plant.

Du Hamel, in his *Phys. des Arbres*, mentions an instance of a root having insinuated itself into a water-pipe, where it increased by sending out an innumerable number of small fibres, till at last it occupied the whole diameter of the pipe, and stopped the current of the water.

If the Impatient Balsam, (*Impatiens Noli-tangere*), grows in a dry soil, the roots are succulent, short, crooked, fleshy, and not much subdivided; in a moist soil, they are more elongated and subdivided, and much smaller; and if it grows entirely in water, they become very much drawn out and

fibrous. Plate I. fig. 1, *a*, represents the roots of the *Impatiens*, as they appear when taken from the earth, and fig. 2, part of a root of the same plant, which grew in water; the same thing is represented in Plate V. fig. 2, where *c* is the roots of the Marsh Calla, (*Calla palustris*), which grew in water, and *b*, those which grew in the earth, from the plant having extended itself over the tub in which it was placed.

WHEN plants are removed from a wet to a dry soil, the reverse of this sometimes takes place, their fibrous roots becoming bulbous or succulent. These, from the quantity of moisture contained in them, are more peculiarly suited to a dry soil, and capable of existing longer in it than plants with fibrous roots, and many plants have the faculty of assuming either the one or the other, as situation or circumstances may require; the Jointed Fox-tail Grass, (*Alopecurus geniculatus*), in its native wet situation has fibrous roots, in very dry soils or when found upon the top of a wall, the



roots are bulbous; and the same thing takes place in the Meadow Cat's-tail Grass, (*Phleum Pratense*.)

The principle implanted in vegetables to adapt themselves to the situation in which they are placed, and the extension and multiplication of their roots, enabling them the more readily to absorb the oxygen necessary to their existence, rendered more difficult when accidentally placed in water, is supposed to be the cause of these varieties.

THE roots of plants are frequently found much stronger, and more extended upon one side than on the other; this may be frequently caused from the soil on that side being more favourable to the growth. If a Strawberry is planted in a spot filled with barren sand, and near some good soil, the roots will always grow towards the side where the good soil is, and frequently decay on the other altogether.

It has also been observed, that trees much exposed to the wind, have their roots stronger, and of greater length on the side

from which the wind generally blows, than on the other; and thus the tree is enabled the better to resist its effects. Mirbel supposes that this proceeds from the agitation of the tree caused by the wind, quickening the evaporation of the fluids, and augmenting the transpiration of the stem and branches on that side, which necessarily occasions a greater suction of the roots, and facilitates their growth *.

WHEN the root becomes unable to supply the plant with sufficient nourishment for its support, and which may happen either from part of the root being accidentally destroyed, from deficiency of moisture in the soil, from the sap having a great length to ascend in the stem, or from the vessels in the stem and branches becoming rigid from age, and thereby rendering its ascent difficult, knobs or tumours are fre-

* In this country the wind blows from the south-west and west, nearly two-thirds of the year, and the tops of trees in exposed situations generally incline to the north-east, the longest roots being to the south-west. Thus, when a violent storm takes place from the north-east, many more trees are blown down, than would have been destroyed had it blown from the opposite quarter.

quently formed on the stem or branches, which are the rudiments of new roots, by which the plant endeavours to supply the deficiency of moisture; and these, if they chance to be near the earth, will readily push out fibres, and become roots.

These knobs, or burs as they are called, may frequently be observed upon old fruit trees, and gardeners make use of their readiness to form roots, by cutting off a branch immediately below one of them, when the fruit is setting; and planting it in a pot, or in the earth, the roots shoot out sufficiently quick to supply the branch with nourishment, and perfect the fruit, presenting the appearance of a fruit-tree in miniature. This method has of late, been adopted with some success in the propagation of fruit-trees, instead of the more precarious one of grafting; and trees raised in this manner, besides other advantages, have that of bearing fruit, even earlier than grafted ones. At Lancefield, the property of James Hardie, Esq. are some young trees at present * loaded with

* September, 1816.

fruit, although planted only the preceding season.

The Chinese take advantage of this propensity in trees to push out roots, in the following manner. They select a tree of that species which they wish to propagate, and fix upon such a branch as will least hurt or disfigure the tree by its removal. Round this branch, and as near as they can conveniently to its junction with the trunk, they wind a rope made of straw, besmeared with cow-dung, until a ball is formed five or six times the diameter of the branch. This is intended as a bed into which the young roots may shoot. Having performed this part of the operation, they immediately, under the ball, divide the bark down to the wood, for nearly two-thirds of the circumference of the branch. A cocoa nut-shell, or small pot, is then hung over the ball, with a hole in its bottom, so small, that water put therein will only fall in drops. By this, the rope is constantly kept moist; a circumstance necessary to the easy formation of the young roots, and to the supply of nourishment to the branch from

this new channel. During three succeeding weeks, nothing farther is required except supplying the vessels with water. At the expiration of that period, one-third of the remaining bark is cut, and the former incision is carried considerably deeper into the wood, as by this time it is expected that some roots have struck into the rope, and are giving their assistance in support of the branch. After a similar period, the same operation is repeated; and in about two months from the commencement of the process, the roots may generally be seen intersecting each other on the surface of the ball, which is a sign that they are sufficiently advanced to admit of the separation of the branch from the tree. This is best done by sawing it off at the incision, care being taken that the rope, which by this time is nearly rotten, is not shaken off by the motion. The branch is then planted as a young tree *. This method is called abscission †.

* Hewitson in Trans. of the Society for the Encouragement of Arts, Manufactures, and Commerce.

† In the Botanic Garden, Edinburgh, a plant of the Dragon's-blood Tree, (*Dracæna Draco*), which was thirty feet in height, and three feet and

A single branch of the Ever-green Rose, (*Rosa sempervirens*,) had been trained alongst a brick wall at Dalbeth, to ascertain the length to which it would grow; after it had extended about fifteen feet, a number of burs were formed upon it, some of which pushed out short roots, which endeavoured to insinuate themselves into the crevices of the wall; the want of sufficient nourishment from the length that the sap had to ascend, probably induced the formation of these burs, as a means of obtaining a better supply, as on the shoots of the same plant, which had been pruned to a moderate length, not one appeared.

These knobs may also serve as reservoirs for sap, enabling the tree to withstand the more readily, the effects of too dry soils or seasons, as in those plants which, in dry soils, form bulbous roots ‡.

a-half in circumference, had, in consequence, become too large for the house in which it stood. A box of earth was placed around the stem, fourteen feet from the top of the plant, into which it pushed out roots; and the experiment would have succeeded perfectly, notwithstanding the succulency of the plant, but that it became necessary to cut it down before the roots were sufficiently numerous to supply it with nourishment, on account of the top of the plant forcing its way through the roof of the house.

PLANTS straitened for nourishment, will often make very astonishing exertions for a proper supply. A Plane Tree which grew amongst the ruins of New Abbey, an old Monastery in Galloway, on the top of the wall, about twenty feet in height, pinched for nourishment in so barren a situation, directed its roots down the side of the wall, till they reached the ground, into which they inserted themselves, and the nourishment it afforded to these roots, during their descent, was amply repaid, the tree having every year since that time, made vigorous shoots, in consequence of the additional supply of moisture.

The Rose-coloured Balsam Tree, (*Clusia rosea*,) a native of the American Islands, between the tropics, a tree about thirty feet in height, has its beautiful scarlet seeds covered with a mucilaginous substance, similar to those of the Misseltoe. These are occasionally scattered by the birds, and falling upon rocks, or the trunks and branches of trees, begin to vegetate; but the roots not finding sufficient nourishment, spread till they find some hole or decayed

part, where there is a little soil, into which they insinuate themselves. The fertility of this being exhausted, a root is discharged out of the hole, till it reaches the ground, often thirty or forty feet distant, when it again fixes itself, and becomes a large tree. The same thing takes place in the White Balsam Tree, (*Clusea alba*.)

The stem of the *Impatiens noli-tangere*, before mentioned, from its brittleness, is very apt to be partially broken by wind or heavy rains; in this case, the supply of sap being partly cut off, new roots are formed above the broken part, which lengthen till they reach the earth. Plate I. fig. 1. *b, b, b*.

Roots are also formed upon the branches and leaves of trees, not for the better supply of nourishment, but as a means of reproduction. Every branch of the Banian Tree, (*Ficus Indica*,) throws out roots; at first these are small tender fibres, several yards from the ground; they continue to increase in length and thickness, until they reach the surface, where striking in, they

rapidly increase in dimension, become stems, and throw out from their tops branches, which in their turn, suspend their roots, and produce new trees*.

“ Branching so broad and long, that in the ground

“ The bending twigs take root, and daughters grow

“ About the mother tree, a pillar’d shade

“ High over-arch’d, and echoing walks between.”

MILTON.

The bottom leaves of the Ladies’ Smock, (*Cardamine pratensis*,) frequently put forth roots, and falling to the ground, become new plants; and roots are protruded from the serratures of the leaves of the *Bryophyllum calycinum*, and from the edge of the leaf near the footstalk, of *Camelia Japonica*. In Cryptogamous plants, this

* A remarkably large tree of this kind grows on an island in the river Nerbedda, in the province of Guzerat. It was once much larger than at present, but high floods have carried away the banks of the island upon which it grows, and such parts of the tree as had thus far extended their roots. What remains, is about two thousand feet in circumference, measured round the principal stems, and the over-hanging branches not yet struck down, cover a much larger space. The chief trunks of this tree, which in size greatly exceed our largest British oaks and elms, amount to three hundred and fifty, and the smaller ones forming supporters or new trees, are more than three thousand, and every one of these is casting out new branches and hanging roots, in time to form trunks, and become the parents of a future progeny.

“ Till, like their mother plant, ten thousand stand

“ In verdant arches on the fertile land.”

propensity is very common. Roots are formed from the stems in *Polypodium scandens* and *Stigmosum*, and many species of *Trichomanes*; and the same thing takes place in many of the Mosses, especially the creeping ones; in some of the latter, the tendency of the stalks to push forth roots is so great, that the whole surface is frequently clothed with fibres, insomuch, that the stalk appears from thence as if really woolly, or tomentose, as in *Hypnum rutabilum*, *plumosum*, *velutinum*, *murale*, *commutatum*, and particularly in *H. tomentosum*, a native of St. Domingo, in *Leskea subtilis*, and many others *.

In some, even the extremities of the shoots and the leaves send out roots. In *Athyrium* and *Asplenium bulbiferum*, tubers are observable below the leaves, and in their axils. In *Polypodium reptans* and *Woodwardia radicans*, roots are produced at the top of the frond, and from the ends of leaves in *Coenoptiris rhizophilla*, and *Asplenium proliferum*, and *rhizophorum*; the same

* Sprengel's Introduction.

thing takes place in some Mosses, as in *Hypnum lucens* and *longirostrum*, and *Mnium cuspidatum*. In the two last, it is the rib of the leaf which gives origin to the root; but in *Hypnum lucens*, whose leaves are destitute of ribs, the cellular texture itself is prolonged into fibrous roots *.

THE shape and appearance of roots depend frequently upon the soil in which they grow. In stony or rocky situations, they become crooked, and irregularly bent and twisted, from the difficulty which they find in obtaining nourishment, and the obstructions they meet with in search of it; in soft soils, they are generally straight, and extend themselves farther †.

MANY Stoloniferous, or creeping-rooted plants, become stationary in certain situa-

* Hedwig.

† Garnett, in his Tour through Scotland, remarked upon the ruins of Torosay Church, several Ash Trees whose roots were twisted in every direction round the walls, in search of that nourishment, which was there so difficult to acquire; and the roots of the Ivy growing in the earth, when compared with those growing upon a wall, exhibit the striking difference of form produced from situation.

tions. The Fern-leaved Comptonia, (*Comptonia asplenifolia*), in a mossy border, increases quickly, and pushes up abundance of suckers; when removed into a clay soil, it ceases entirely to send out lateral runners, although the plant remains perfectly healthy. In this country, the Common Acacia, (*Robinia Pseud-Acacia*), seldom sends out suckers; in its native place, it propagates itself in that manner abundantly. In the memoirs of the Agricultural Society of Paris, we are told that a farmer in North America, on the year of his marriage, as a portion for his children, planted a field of fourteen acres with suckers of this tree, which is there much valued. His eldest son married at twenty-two, and on that occasion, the farmer cut down three hundred pounds worth of timber out of his Acacia wood, which he gave to his son to buy a settlement in Lancaster County; and three years afterwards, he did as much for his daughter; and thus provided for his whole family, the wood in the mean time repairing by suckers all the losses it sustained.

A plant acquiring this habit, from being placed in a soil favourable to the production of suckers, not only retains it itself, but frequently communicates it to its offspring. This is well known to gardeners, who in propagating Gooseberries, avoid taking the cuttings from bushes that send up suckers, as in that case, the young plants almost invariably have the same propensity.

SOME plants with bulbous roots in peculiar soils, assume an appearance of being creeping-rooted, or cæspitose. This is exemplified in the Scarlet Antholyza, (*Antholyza Æthiopica*), where the bulb-tubers often remain sterile, whilst they waste themselves in the production of a swarm of offsets *. The soil being peculiarly favourable to the growth and increase of the roots, these spurious bulbs seldom or never flower, the necessity of perfecting seed being obviated by this method of reproduction.

Bulbs planted in water, as the Hyacinth, Narcissus, and Tulip, on the other hand,

* Bot. Mag.

seldom produce young bulbs, the nourishment which they draw from the water is little more than adequate for their support, and the developement of the flower; and one or two years cultivation in a rich soil is necessary afterwards, to restore them to their strength and reproductive faculties.

It was the practice with a nursery-man who had long cultivated the Flowers of the Polyanthus Narcissus for sale, in the neighbourhood of London, to cut them off as soon as one or two of the blossoms were expanded, and put them into water, taking care however, not to injure the leaves; and, in consequence, the bulbs produced every year as abundant crops as new ones imported from Holland *. In this case, the bulbs were not exhausted by the production of seed, and their propensity to flower and perfect seed was probably proportionably increased.

MANY varieties in the shape of roots, are produced by sowing the seeds; and a most unaccountable circumstance with regard to

* Salisbury in Trans. of Lond. Hort. Soc.

them is, that in some cases, the variety is uniformly reproduced by seed, and in others it is not.

Examples of these varieties are familiar to every one in the different shapes of many of our cultivated roots, as the Radish, Turnip, and Potatoe; in the two-first, the round and oblong shape is uniformly produced from the respective seeds of each, whilst in the latter, sowing the seeds is productive of innumerable varieties *.

* A curious anomaly in point of shape presented itself this season, in a turnip, in the garden at Lancefield. Instead of the round shape natural to it, it was drawn out into an oblong form, above eleven inches in length, six and a-half in circumference, and of nearly a uniform thickness throughout; some obstruction in the soil which had prevented its increase laterally, probably produced this appearance. The roots of the Mandrake, (*Atropa Mandragora*,) were formerly supposed to have a resemblance to the human form, being figured in some of the old herbals, the male with a beard, and the female with long hair. These shapes were produced by the roots of the Mandrake or Briony ‡ being forced to grow through moulds of clay, fantastically formed, which gave them a similar shape, and thereby enabled the mountebanks of those days, the better to impose upon the simple.

THE disease in Turnips called fingers and toes, from the form into which the bulbs shoot, is supposed to be produced by insects, and the tubercules frequently found upon them and on the roots of the wild Mustard, (*Sinapis arvensis*,) is formed and inhabited by the grub of *Rynchænus assimilis*. Kirby and Spence.

‡ The Briony (*Bryonia dioica*) was frequently made use of in place of the Mandrake,

THE same observation is applicable with respect to the colour of roots; varieties at first produced by accident, have, in some cases, become permanent*, and in others are easily lost †.

The small, white and tasteless root of the wild Carrot, can no longer be recognized in the large succulent, and highly flavoured red or yellow Carrot of our gardens ‡, and the small and acrid Parsnip, (*Pastinaca sativa*,) under the hands of the gardener, becomes large and nutritious, retaining only its sweetness, without any portion of its former acrimony.

Cultivation, a greater or less degree of nourishment, or in the change of colour,

* As in the yellow, red, green, or white, Turnip, or the scarlet, purple, black, or white, Radish.

† The Squill, (*Scilla maritima*,) has the roots red or white, from the soil in which it grows, and a variety of Potatoe has lately been introduced in this neighbourhood, with the flesh and skin of a dark purple colour, which setting aside its forbidding appearance, is an excellent, as well as a productive variety.

‡ The Carrot is found in our gardens of a large size, and of a whitish, pale yellow, orange, red, or purple colour; but although these varieties have unquestionably their origin in the common wild Carrot, yet it is very doubtful how far the most careful cultivation could, in this country, cause it to assume the size and qualities of the cultivated root. It has probably acquired its anomalous appearance in a warmer climate, from whence it has been introduced here.

probably the different combinations with oxygen or with acids, are most likely the primary causes of many of these anomalies, but the mode of operation is unknown; accident presenting them to us at first, the skill and industry of man is directed to their continuance, and fully rewards his labours.

SECTION II.

ANOMALIES OF THE STEM AND BRANCHES.

THE Stem may be defined as a continuation of the root above ground, or the principal support of the parts of a vegetable. It is divided into Branches, and these again into smaller ramifications or twigs, which are merely an extension of the branches, and bear the Leaves, Flowers, and Fruit.

The stem and branches are, from their situation, much more liable to accidental variations than the roots, and the strict uniformity in structure and organization between them and the roots, is frequently the cause of variety in the former, proceeding from the latter.

IF the roots of a plant are partially cut off, the corresponding branches suffer in proportion; and it is asserted, that if the roots on one side only be destroyed, the branches on the same side languish or die; and experiments have long since demonstrated, that a plant raised and planted with its top in the earth, will have it converted into roots, whilst the former roots exposed to the air, quickly become branches, and produce leaves and flowers.

EVERY plant has a climate, soil, and situation, more peculiarly suited to itself, and for which its habit is best adapted. Some delight in the highest mountains, others will only flourish in the sheltered valleys; and whilst some are found in the richest moulds, others prefer the poorest and most barren soil, in which they abundantly increase, and which they adorn with their luxuriant foliage. Many cover rocks and stones, where little apparent moisture is to be found, and where, like the *Epidendrum Flos-aeris*, they seem to live

upon air *, whilst others enrich the surface of our lakes and rivers, with their leaves and blossoms. Many require the most fervid heat for their existence, whilst some can endure the greatest degree of cold, and it is from this variety of disposition, if it may be so called, that the whole earth is so abundantly covered with vegetables.

Plants furnished with these requisites, assume a character peculiar to themselves, from which they seldom depart when in a natural state, and any variation from their primitive form generally arises from being deprived of them.

VARIETY in point of size and luxuriance is often the effect of climate or soil.

Cold has the effect of cramping vegetables, of retarding their growth, and making them small and drooping. Trees growing on high mountains seldom acquire the size of those in low and more sheltered situa-

* The Air Plant, (*Epidendrum Flos-Aeris*), a native of the tropical countries, has the singular faculty of remaining fresh, and even of blowing for a long time after it is cut. The inhabitants hang branches of this plant from the ceilings of their rooms, where they flourish and expand their blossoms for many months.

tions. The Oak, (*Quercus Robur*), a native of the plains, is sometimes found on very high hills, but its size and luxuriance decreases with the height it ascends, till at last it ceases entirely to exist *.

* The Oak, in favourable situations, grows to a very large size; the following are the dimensions of the most remarkable in this country.

An Oak on the Estate of Woodhall, purchased by Sir Thomas Rumbold, measured 24 feet round.

The Greendale Oak, described by Gough in his edition of Cambden, had a road cut through it, height of the arch 10, and the width 6 feet; the diameter of the tree at the top, where the branches issued, was 14 feet 2 inches, at the surface of the ground, 11 feet 6 inches, and the circumference there 35 feet.

An Oak in Langley woods, near Dowton, measured 6 feet 2 inches diameter at the bottom, contained about 10 tons of wood, and was perfectly sound; it was supposed to be nearly one thousand years old.

Damery's Oak, near Blandford, in Dorsetshire, was 68 feet in circumference at the ground, and seventeen feet above the ground it was four yards.

Wallace Oak, in the Torwood, County of Stirling, was 11 or 12 feet in diameter.

Hern's Oak, in Windsor Forest, was 24 feet in circumference.

Queen Elizabeth's Oak, at Herington, in Suffolk, was 35 feet in circumference.

The Fairlop Oak, in Hainhault Forest, Essex, about a yard from the ground, is 36 feet in circumference. It divides into 11 arms or branches, which overspread an area of 300 feet in circuit.

The Shire Oak, near Worksop, overspreads a space of 90 feet from the extremities of its opposite branches.

Chaucer's Oaks, at Dounington Castle, near Newbury. The largest carried an erect stem of 50 feet, before it broke into branches, and was cut into a beam, 5 feet square. Another yielded a beam 40 feet long, perfectly straight without knot or blemish, 4 feet square at the butt end, and nearly a yard at the top.

On the other hand, Alpine plants when brought to the plains, increase considerably in size; and plants brought from warm to cold climates, or the reverse, change so much in appearance as scarcely to be recognized. The Kidney-root, Saxifrage, (*Saxifraga stellaris*), is gathered in the valley at Keswick Lake, nearly a foot high, with leaves above an inch in length, having a

The Magdalen Oak, at Oxford, extended its branches 16 yards on every side, from its trunk, and could easily have sheltered three thousand men.

The Bodington Oak, in the vale of Gloucester. Circumference at the bottom, 13 yards; at three feet high, 24 feet; and at six, 36 feet.

The Skelton Oak, near Shrewsbury. Circumference at the bottom, 45 feet 3 inches; five feet from the ground, 25 feet 1 inch; eight feet from the ground, 27 feet 4 inches. Height of the tree to near the top, 41 feet 6 inches.

Sir Philip Sidney's Oak, in Penhurst Park, Kent. Circumference close to the ground, 35 feet 6 inches; one foot from the ground, 27 feet 6 inches; at five feet, 24 feet. Height, 73 feet. Circumference of the lowest branch, 6 feet 9 inches.

Beauty, Stately, and Majesty, three Oak trees in the park of John Plumtree, Esq. near Deal, in the County of Kent, have the following dimensions. Beauty is 63 feet high; five feet from the ground, the circumference is 15 feet 9 inches, and the solid contents of the tree without the bark, is 12 tons. Stately, four feet from the ground, is 18 feet in circumference, and its solid contents is 12 tons. Majesty has, eight feet from the ground, a circumference of 28 feet 4 inches; and twenty-eight feet from the ground, a circumference of 15 feet 6 inches. One arm contains 68 feet 11 inches; another, 64 feet 2 inches; a third, 60 feet 9 inches; and the total contents are above 36 tons.

Two Oaks in Hamilton Park measure, one 25 and the other 27 feet in circumference.

panicled stem, with many flowers, whilst specimens found on the summit of Snow-down, do not rise above an inch.

BUT the most striking change upon plants, as to size and luxuriance, is effected by soil and cultivation, of which our gardens and orchards daily present us with numerous examples.

The Crab Tree, in its native situation, is small, useless, and covered with thorns; cultivation increases its size, the thorns disappear, or change into branches, bearing fruit, large, juicy, and of the most delicious flavour. The effect of soil and cultivation is strikingly illustrated in the instance of a Pear Tree, mentioned by Withering. It grew near the Parsonage House, at Home Lacy, a seat of the Duke of Norfolk's, and has spread from a succession of layers, to nearly the extent of a quarter of an acre, thus forming an orchard of itself, having yielded for many years from twelve to sixteen hogsheads of perry.

In their native states, the Asparagus, and most of our esculent plants are small,

fibrous, and not eatable; when cultivated, they become large, succulent, and nutritious

The Common Chickweed, (*Alsine media*), and Shepherd's purse, (*Thlaspi bursa-pastoris*), vary in size so much from the soil in which they grow, as scarcely to be distinguished in their different states. The *Cardamine hirsuta*, in marshes, attains the height of two feet, in dry situations it is seldom above five or six inches; and the Wood Horse-tail, (*Equisetum sylvaticum*), is found in wet rich ground, (as in the woods at Lanark,) nearly six feet high, whilst in dry pastures, and on the road sides, it is never above one.

That well known grass, the Fiorin, (*Agrostis stolonifera*), when found on the sea-shore, is seldom above three or four inches in height; by cultivation it attains as many feet, and produces (it is said) year after year, sixteen or eighteen thousand pounds weight of hay per acre*.

Even in water-plants, soil, or as in some of the sea-weeds, the being within, or alto-

* Two acres and a half are said to have produced ten tons of hay in one year.

gether out of the influence of fresh water, alters much their appearance and texture. Dr. Goodenough mentions, that in the more inland banks of the Severn, and in the extensive estuary in the north of Lancashire, formed by the influx of the Ken, Leven, and other streams, *Fucus canaliculatus*, is sometimes found remarkably luxuriant; and at Ilfracombe, where there is a very trifling influx of fresh water, *Fucus fastigiatus*, grows so slender and compact, as to be with difficulty known. At Ilfracombe likewise, says the same author, *Fucus fibrosus*, grows scarcely more than a foot high, but it has been seen thrown on shore at Weymouth, after a storm, actually appearing at first sight, like the root of a large tree. The Salt-wort, (*Glaux maritima*), in the wet sandy places where it grows naturally, on the banks of the Clyde at Dumbarton, is scarcely five or six inches high; when cultivated it becomes very luxuriant.

MANY plants which have naturally a single stem, in richer soil become branched.

Sir Edward Smith says, that the Willow-herb, (*Epilobium angustifolium*), in its native place, has generally a simple stem; by cultivation it becomes branched; and the Purple and Common Loosestrife, (*Lythrum salicaria*, and *Lysimachia vulgaris*), and many *Campanulas*, have their branches much increased in number by the same means.

Even the Dwarf Thistle, (*Cnicus acaulis*), which, as the name imports, has no stem, or a very short one, in the garden acquires one, and often becoming branched, bears two or three heads instead of one. The Sundews, (*Drosera rotundifolia* and *longifolia*), occasionally become caulescent; and the Hairy Stonecrop, (*Sedum villosum*), when cultivated, has frequently from eight to ten branches*.

The frond of the Spleenwort (*Scolopendrium officinarum*) is naturally simple, but a beautiful branched variety is cultivated in gardens, and this is accompanied with a corresponding fulness in the leafy part,

* Accident sometimes causes simple stems to assume the same appearances; when the stems of *Equisetum*, *palustre*, or *hyemale*, are broken, the part that remains becomes branched.

which is waved and crisped, (*dedaleous*).
Plate III. fig. 2*.

Most plants have their stems more or less cylindrical, but a singular anomaly takes place where they become flat and broad †, as if two or three were joined laterally together; this occurs most frequently in herbaceous plants, more rarely in trees or shrubs.

The Orange Lily, (*Lilium bulbiferum*), Monk's-hood, (*Aconitum napellus*), Asparagus, Black Briony, (*Tamus communis*), Alpine Saw-wort, (*Serratula alpina*), and Bee-Larkspur, (*Delphinium elatum*), are very subject to this appearance, and it is occasionally met with in the Spurge Laurel and sweet scented Daphne, (*Daphne Laureola*, and *odora*), in the Common Ash ‡, and in some of the Willows and Spindle trees.

In general, the flat stem continues undivided, but sometimes within a few inches

* *Lingua cervina minor crispa, fol. multifido ramosa.* Branching-clustered Hart's-tongue Spleenwort. Plukenett's Phytographia.

† *Caule plano compresso.*

‡ Keith's Physiological Botany.

of the top it separates into two or three parts, which are irregularly bent or twisted; this is not uncommon in the Asparagus, and a plant of the common purple Grape Hyacinth (*Hyacinthus comosus*,) exhibited the same appearance, having its flat branched head covered with the little blue petals *.

Du Hamel accounts for the flattened stem, by supposing that an unnatural graft has taken place in the bud, and thus united the shoots that would otherwise have been distinct; but this has been objected to, on the ground that it would not cause them to be compressed or flattened in their aggregate growth. Besides, it frequently happens, that the stem is not flattened throughout its whole length, often the under part of it is of the natural appearance, and the flatness commences a considerable way up.

* Gilibert found near Grodno, several plants of the *Ranunculus bulbosus*, in which the roots, the stems, the flower-stalks, and even the flowers, were united or bundled together. The stalks were flattened, an inch in breadth, having the appearance of three stems united together; and the flowers, instead of being round, were lengthened out, with about twenty petals.—Histoire des Plants d' Europe.

This anomaly sometimes becomes habitual to the plant. Withering mentions having found the Marsh Thistle, (*Carduus palustris*,) with a flattened stem, and the root produced the variety for two years; and a plant of the Orange Lily at Dalbeth, has had several of the stems thus disfigured for many years past. It may also, in some instances, be propagated. The Cockscomb Stonecrop, a variety of the Reflexed, (*Sedum reflexum*,) with a flat stem, is very generally cultivated in gardens, and may be made to assume its natural appearance, or retain its acquired one, according to the soil in which it is planted.

When the stem is flattened and enlarged, the number of flowers is proportionably increased; on an Orange Lily there is sometimes fifty or sixty, and a flat stalked Cowslip (*Primula veris*) had no less than one hundred and twenty petals; they presented the appearance of an Umbel, the stalks supporting the petals, increasing in length as they approached the outside, some of them being three or four inches long; half way down the stem, one or two solitary

flowers were supported by long slender footstalks.

THE absence or presence of thorns, prickles, and hair, on plants, is much affected by soil and cultivation.

Thorns are ligneous, that is, proceed from the woody part of the plant, and not from the bark, like the prickles; they are supposed to arise from a bud, which from want of sufficient nourishment, has not been enabled to evolve itself, and consequently remains in the form of a short twig, without leaves. This theory seems sufficiently probable, as Crab Apples and Oranges, which, in their native place, are always furnished with thorns, when subjected to cultivation, have them changed into boughs, which soon produce leaves and fruit; and there can be no doubt but that they might be again restored to their savage state, by a contrary treatment.

The Prickly Endive, (*Cichorium spinosum*,) Thorny Mullein, (*Verbascum spinosum*,) the Narrow-leaved Oleaster, (*Elæagnus angustifolius*,) and many other plants, have their

branches terminated by a thorn or a bud, as they are cultivated in a poor or a rich soil.

Plants which have very numerous thorns, as the Sloe, (*Prunus spinosa*), are seldom entirely divested of them by cultivation, but the number is always much decreased; and on plants which have always thorns, the number varies. The Tuberous Furcroea (*Furcroea tuberosa*) has, in general only one spine, but it sometimes is found with two *.

AGE is frequently the cause of thorns in plants; in those with pinnate leaves, when the leaves drop off, the petiole remains and becomes a thorn; this takes place in the Goat's-thorn Milk Vetch, (*Astragalus Tragacantha*), and in some of the *Mimosæ*, the stipulæ become sharp and woody, and finally change into thorns. The simple unjointed leaves of many of the new Holland species of Mimosa, says Mirbel, ought to be considered only as transformed petioles.

* A variety of the Yellow-spined Indian Fig, (*Cactus Tuna*), has black spines, and the Small Cactus, (*Cactus mammillaris*), varies with red and white ones; these, though probably at first produced by accident, are perfectly permanent.

The gradual change that takes place, may be seen in *Mimosa stricta*, *floribunda*, *obliqua*, &c. when the leaflets fall off, the petioles or leafstalks, change their form and structure. Many of them increase in thickness, in the middle, and lengthen out and contract towards the end; some form a thin plate of equal size through their whole length, whilst others harden and sharpen into real thorns; thus showing the extreme flexibility of vegetable organization. The same thing may be observed in *Mimosa decurrens*, in which, even in this country, the leafstalks remain after the leaflets have fallen off, and would, no doubt, in certain soils, undergo a similar transformation.

THE stipulæ of some plants are occasionally converted into prickles, as in the Common Acacia, (*Robinia Pseud-Acacia*), and the Barberry (*Berberis vulgaris*), but a prickle can never become a shoot, being simply a continuation of the bark or cutis.

Most Roses are armed with prickles; it is said that these disappear when the plant is cultivated amongst sand, this however,

needs confirmation; but the Alpine Rose, which in its native mountains, is entirely devoid of prickles, acquires them in lower regions. The Common Gooseberry (*Ribes grossularia*) is sometimes found without prickles.

THE tendrils of Vines occasionally produce flowers, and bear fruit, from which it would seem that they are only abortive branches; and in the Bladdered Fumitory, (*Corydalis vesicaria*), represented in the title page, the ends of the branches are terminated with tendrils, which frequently change either partially or entirely into leaves.

HAIRS or down are supposed to be organs of absorption and exhalation, and the circumstance that the plants found on dry soils and in warm climates, and those most exposed to the sun, are in general more hairy than others, seems to confirm this; yet the most contrary results frequently take place, which it is difficult to account for.

For instance, the *Sedum villosum*, a native of wet spongy places, becomes comparatively smooth in dry ones; the Amphibious Bistort (*Polygonum amphibium*) is less hairy when growing on dry ground, than when in water; and the *Cardamine hirsuta* loses its downyness in a dry soil.

On the contrary, the Buck's-horn Plantain, (*Plantago coronopus*), which when growing upon dry rocks or sand, is smooth, becomes rough when cultivated in the garden; and the Creeping Crowfoot, (*Ranunculus repens*), in damp places becomes smooth. The Mints and *Primulæ* vary constantly in the degree of roughness or smoothness, from soil or situation.

These anomalies, as in some others, although very variable in general, sometimes assume a degree of permanence, which change of soil will not alter, as in the hairy variety of the Wild Thyme, (*Thymus serpyllum*), which may be cultivated in almost any soil, without changing in its appearance.

THE next anomaly that presents itself,

is one which has been productive of great benefit to man, in as much as it has instructed him in the means of securing and propagating many varieties of plants, which would otherwise have been lost. It sometimes happens that the stem, branches, and even the roots of trees, meeting together, become united apparently into one; this is termed a natural graft, and may frequently be observed in the Ivy, where it often takes place in two or three different places, two branches uniting and separating again, in their convolutions round the tree that supports them *. In the *Clusia rosea*, and *alba*, before alluded to, the roots in descending from the trees on which the seeds have accidentally fallen, often unite together in a natural graft, and become covered with

* Garnett mentions a Lime Tree, called the Marriage Tree, which presented this anomaly in a singular manner.

“The tree is very large, consisting of two principal branches, that have separated a few feet above the ground, and have each grown to so immense a magnitude, that their weight must long since have disunited them, but for the following remarkable circumstance: at the height of about twenty feet, a strong branch has pushed out of one of the main branches, and grown firmly to the other; and so complete is the junction, that it is impossible to say from which trunk the branch has proceeded, for it seems to have come from each.” Tour through Scotland. See figure at the end of the Section.

the same bark, forming an impervious mantle around the tree from which they proceed. The idea of grafting, now so successfully pursued, was probably first suggested by examples similar to these*. The graft, considered in the most general point of view, has been defined as “the union of two parts of the same or different vegetables; but the Horticulturist gives especially the name of grafting to that operation which consists in removing from a vegetable, a branch, or a portion of the bark, provided with a bud, and placing it upon another vegetable, so as the two barks shall be in immediate contact.” It is necessary that there should be an analogy between the two plants thus operated upon, as the different varieties of Pears and Apples upon each other, for although sometimes trees not very nearly allied, can

* A very simple method of grafting is practised in Westphalia and other parts of Germany. The German husbandman throws up a parapet of earth, with a ditch on each side, and plants his sets, raised from layers of the Hornbeam, (*Carpinus betulus*), in such a manner, as that every two plants intersect each other; then he scrapes off the bark, and binds them close together with straw. The plants consolidate and form a living palisade, which being pruned annually with discretion, will in a few years make an impenetrable fence.

be united, the duration of these unnatural grafts is in general very short.

We find indeed, in old writers, many accounts of grafts performed on trees of quite different natures, as the Vine upon the Mulberry, and the Rose upon the Holly and Black Currant, in which last case the colour of the flower is said to become black, but experience has confirmed the absurdity of such statements *.

By grafting, no new varieties are produced, the great advantage gained by it, is the preserving and propagating those already produced, as a graft is simply a bud or slip planted in a vegetable substance, and nourished by the sap it receives from it.

ANOTHER advantage derived from grafting, is the production of fruit at a more early period than would otherwise be the

* It is, however, a very surprising and altogether an unaccountable circumstance, that plants which do not lose their leaves, and are evergreen, can be grafted upon others which are deciduous, provided they are nearly allied. Thus the Common Laurel, (*Prunus Lauro-Cerasus*,) may be grafted upon the Perfumed Cherry Tree, (*Prunus Mahaleb*,) and the broad leaved Medlar, (*Mespilus Japonica*,) upon the Common one, (*M. Germanica*.)

case if the plants were raised from seed. Trees in general do not produce flowers or fruit till they have attained a considerable age, but if a shoot from a tree capable of bearing fruit, be grafted upon a young one although not arrived at a period to bear, flowers and fruit will shortly be produced.

If a shoot of one year's growth from an old tree, be grafted upon a seedling of the same age, fruit may be thus produced in two years, which would not otherwise have appeared for a much longer time. Gardeners take advantage of this circumstance to produce those dwarf trees, which are often covered with fruit, although only a foot or two in height*.

THE stems and branches of trees are frequently affected by hard tumours or knots;

* In the garden at Dalbeth, is an Orange Tree two feet in height, and with a stem scarcely two inches in circumference, which has thirteen ripe, and above twenty unripe fruit upon it. The exhaustion that necessarily takes place in such plants, must shorten much the term of their existence; and it has been of late much doubted, whether the system of grafting has not a tendency to cause trees to lose the faculty of increasing by seed; in this manner the barrenness of many species, cultivated for a long time by cuttings or grafts, is accounted for, as the Guelder Rose, (*Viburnum opulus*,) the Sugar Cane, (*Sacharum officinarum*,) the *Hydrangea hortensis*, and *glauca*, and many others.

this is sometimes produced from a want of sap, as before noticed under the Anomalies of the Root*. But too large a supply, or an improper direction of the sap, from the bite of insects, or the rupture of the vessels, may likewise occasion this. That a mal-conformation of the sap vessels, from age or accident, produces this effect, is evident from a dissection of the knots, the vessels being found in them of a great variety of forms, and variously ramified and combined, whereas between the knots they are generally simple and not branched, and thus the vessels conveying the sap irregularly, the wood is also irregularly formed. These knots are frequently found imbedded in the wood, sometimes connected with it, and at other times separate, and only surrounded by a common bark.

AN undue determination of sap towards one particular branch, is the cause of the bunches or knots so frequently to be observed in the Birch Tree; the knot being plentifully supplied with nourishment, sends

out many shoots and twigs, and forms the bushy appearance called the Witch Knot. On measuring one of these knots, I found the stalk that supported it, to be one inch in circumference; from the knob issued nearly three hundred twigs, (each supporting many smaller ones,) from two or three to eight inches in length, and on an average, about two-eighths of an inch in circumference. Thus two hundred and fifty at two-eighths of an inch, gives a circumference of sixty-two inches and a half, which was fully supplied with sap passing through the circumference of an inch *.

In these knots, the buds are frequently produced two and three together, and the joints are much swollen.

TUMOURS or swellings also appear upon the branches or buds of plants, which owe their origin to the puncture of an insect in order to deposite its eggs. The vessels being thus injured, receive a different direction,

* The branches proceeding from these knots, are often much more numerous, sometimes consisting of above a thousand; at Crossbasket, the seat of General Peters, are some remarkably large ones upon the Birch Trees on the banks of the river near the house.

and twist round the eggs; the irritation produced, occasions, as in organised bodies, a greater flow of sap towards the wounded place, which being deposited in greater quantity, and perhaps faster than it ought to be, produces the spongy excrescence destined for the habitation and food of the insect within.

When the egg is hatched, the young larva, by some means yet unknown, stimulates the vital principle of the plant, and causes the part in which it is lodged to assume a great degree of luxuriance, displayed in various whimsical excrescences, foreign to the nature of the plant in itself, but each appropriated to the particular kind of insect from whose operations it springs. The original perforation is closed up and entirely obliterated; at length the maggot having fed on the juices of the plant copiously directed to the injured part, undergoes its change to a chrysalis, and finally to a winged fly like its parent, when it immediately escapes from its confinement by a fresh perforation, and the gall being left empty soon dries and hardens *.

* Smith in Cyclopædia.

The insect that most generally produces these excrescences is the Gall-Fly, *Cynips* of Linnæus, and it is most remarkable that guided by some peculiar instinct, each species of Gall-Fly regularly frequents a particular tree, and a particular part of that tree, and the galls produced by the same species are always of a form peculiar to themselves. Thus some form their galls on the under surface of the leaves of the Oak only, as the *Cynips Quercus folii*, and *C. Quercus inferus*, and the galls formed by these species are always globular. Another species, the *C. Quercus petioli*, forms convex galls upon the petiols of the Oak; the *C. Quercus pedunculi*, forms granulated connected galls upon the male flowers of the Oak, and the *C. Quercus ramuli*, is the cause of the white woolly ones found on the small branches of the same tree*. The *Cynips Quercus gemmæ*, figured in Plate XI. is always found on the bud; fig. 1, *a*, represents a branch of the Oak with a gall formed by this species cut open; *b*, the insect after having made its way out.

* For the galls formed on the leaf, see "Anomalies of the Leaf."

In the Summer of 1815, the Oak Trees in this neighbourhood were much infested by these insects, and the galls produced were frequently as large as a small apple. After a few weeks they produced abundance of flies, which ate their way out, although the galls were so hard, as to be with difficulty cut with a knife *.

Another species of gall into which the bud is transformed, instead of being smooth, is covered with numerous thin scales, giving it a very elegant appearance, similar to an Artichoke; this species is seldom inhabited by more than four or five flies.

The Wild Rose, (*Rosa canina*,) is subject to a species of gall covered with a substance like moss, of different colours, occasioned by the puncture of the *Cynips Rosæ*, and is peculiar it is said, to that Rose only. It was formerly much used in medicine, and given under the name of Wild Rose Sponge or Bedeguar, in cases of diarrhœa, dysentery, &c. The ends of the branches of the same plant, and of the Eglantine, have

* These flies, upon being bruised, exhaled a strong odour, pungent to the taste, and similar to the acid procured from ants by distillation.

sometimes instead of flowers, a cluster of ten or twelve spongy galls, of different sizes, from that of a pea to an olive, of a reddish colour; some of these are quite smooth, and others partially sprinkled with small short spines. This species is much more rare than the former one *.

The Rose Willow, (*Salix helix*), receives its name from bearing excrescences like a Rose on the ends of some of its branches, arising from the puncture of a species of *Cynips* peculiar to it. Sir Edward Smith mentions, that the young shoots of *Salvia pomifera*, *triloba*, and *officinalis*, swell into large juicy balls like apples, and these are often crowned with the rudiments of leaves resembling the calyx of the fruit; this species is much esteemed in the Levant for its aromatic and acid flavour, especially when prepared with sugar †.

OVAL knots or swellings are sometimes found upon the stalks of some of the Hawk-weeds, (as *Hieracium sabaudum* and *umbella-*

* Reamur.

† Introduction to Botany.

tum,) the Bramble, and some of the Thistles, which have their origin from similar causes, but when the stems are swollen and twisted, protruding a white substance which turns to powder, as in the Shepherd's Purse, (*Thlaspi Bursa-pastoris*,) it is occasioned by the stimulus of a parasitical fungus *, irritating the vital principle of the plant, like the progeny of insects already mentioned †.

IN MOST trees the branches shoot upwards, but a singular anomaly presents itself in those called Weepers, which have a predetermination to grow downwards. In some trees, the extreme slenderness and pliability of their branches easily accounts for this, as in the weeping variety of the Birch, (*Betula alba*,) and the Weeping Willow, (*Salix Babylonica*,) whose branches being unable to support their own weight, naturally bend downwards. But in the weeping variety of the American Elm, (*Ulmus Americanus*,) and more especially in the Weeping Ash, now so much culti-

* *Uredo Thlaspi*.

† Introduction to Botany.

vated, there is a predetermination to grow downwards, a propensity which no care can prevent, and which it seems impossible to account for.

Miller mentions a tree of this kind which grew naturally so, at Gamlingay in Cambridgeshire, and it is said not to be uncommon in trees of considerable age, especially when growing by the water-side. If this is the origin of the variety, it presents another instance of an unnatural habit being retained in a plant, after the exciting cause is removed; as to the idea entertained by some Gardeners, that this propensity in plants has been occasioned by an inverted bud, the slightest experiment will suffice to show its absurdity*.

THE STEMS of plants are frequently upright, or the reverse, for the purpose of

* Mr. M'Nab of the Botanic Garden, Edinburgh, inclines to think the Weeping Ash a distinct species, and that it may be propagated by seed. To ascertain this, he has sown the seed of it, from which plants have risen, but they are still too young to be distinguished from those of the common Ash. Should these have the same propensity as the parent plant, they must continue within a few inches of the ground during their life, as it is difficult to see how they can increase otherwise than by stretching along it.

adapting themselves to the situation in which they are placed. The Ivy, when not near any tree or building for its support, necessarily creeps on the ground, and in this situation seldom bears fruit, but propagates itself by pushing out roots from the prostrate stems. In like manner, the *Sisymbrium terrestre*, when cultivated in dry ground, has the stem erect, and produces abundance of seed; in wet situations, from the too great abundance of moisture being unfavourable to the production of flowers, it seeds sparingly, and the stalk becomes procumbent and takes root at the joints.

IN GENERAL there is a conformity in outward appearance and colour, between plants of the same species, but even in this, deviations sometimes take place.

Persoon, in the Transactions of the Linnean Society, mentions a singular variety of the Beech growing near the village of Reinhausen, a few miles from Gottingen, the bark of the trunk and larger branches of which, is entirely formed like that of the Oak, by which it may at once be known

from other Beeches. The tree has likewise the crooked and proportionally short branches of the Oak, so that a spectator at some distance in the winter season, would undoubtedly take it for such. The people in the country have an opinion of its having originated from the intermixture of an Oak with a Beech *.

SOMETIMES the colour varies, as in the pretty variety of the Maple, called the Snake-bark, supposed to be a variety of *Acer Pensylvanicum*; in this instance age deprives it of its stripes.

There are two varieties of the American Elm, in one of which the branches are red, and in the other white; and the red and white varieties of the Common Beech, called the Mountain and Wild Beech, are merely the effect of different soils.

The *Aster corymbosus*, and *Solidago lateriflora*, vary with purple and green stems; and there is a variety of the Guelder Rose with red branches. Many other plants present instances of similar anomalies.

* *Fagus, sylvatica*; *varietas quercoides, cortice tessellato-sulcato.* Pers.

Soil and climate, especially the latter, have a great effect in prolonging or shortening the existence of vegetables, and for this reason, duration can never be had recourse to, as a specific distinction.

Many plants which in this country are biennial, in warmer climates are annual; here, the cold retards their growth and time of flowering, till the second year, when having perfected their seeds, and provided for the increase of their species, they become exhausted and worn out, the irritability of their vessels becomes impaired, and their roots and stems decay.

Plants that with us are annual, that is, that through the heat of our climate are enabled to perfect their seeds in one season, and would naturally die, sometimes have their existence prolonged, when by any accident they are prevented from flowering; as if aware of not having fulfilled the purpose of nature, they linger till a more favourable season enables them to do so*.

* A plant of the Night Smelling Rocket, (*Hesperis tristis*), a biennial, from its having been regularly deprived of its flowers, and of course prevented from seeding, has remained for three years in the garden at Dalbeth, and is at present perfectly vigorous.

The Banana Tree, (*Musa sapientum*), in South America and the tropical countries, grows to its full size, and perfects its fruit within the year; when cultivated in our green-houses, it lives for many years, the more moderate heat preventing it from flowering. For the same reason, many annual plants become biennial, and even perennial, from the flowers becoming double or monstrous; in that case, the parts of fructification are destroyed, and they are prevented from perfecting seed, as in the double Indian Cress, and double Snapdragon. The same effects take place from unfavourable soils; in a rich soil, the Chinese Pink (*Dianthus Chinensis*), produces its flowers in one season, and ripening its seeds, dies; in a dry poor soil, where there is not sufficient moisture to enable it to flower, it becomes biennial*.

It frequently happens, on the other hand, that plants which in warm climates are

* Too great a supply of moisture may sometimes have the effect of invigorating a plant so much as to prolong its existence. Mr. Teesdale mentions that the Sheep's-bit Scabious, (*Jasione montana*), a plant that in its dry sandy native soil, is always annual, when cultivated in a garden, becomes perennial.

perennial, in colder ones become annual, being unable to resist the severity of the winter; and these can only be renewed annually by sowing the seeds; and for the same reason, many shrubby plants, natives of warm climates, in colder ones become herbaceous, the stems being cut down each winter, although the cold is not sufficiently severe to destroy the root. The Scarlet Fuchsia, (*Fuchsia coccinea*,) in Chili, is a shrub, attaining the height of eight or ten feet; with us, it becomes herbaceous, the stems are annually destroyed, whilst abundance of new ones replace them every succeeding spring. "Even the seedling offspring of plants," says Mr. Knight, "have a constant tendency to adapt their habits to any climate in which art or accident places them;" and when an exotic from a warmer country produces seeds in a colder one, the seedlings are found to be much more hardy than the original plant.

Thus, by a wise provision of Nature, plants become habituated to almost any situation in which they may be placed, and it is probable that many tender exotics

might be taught to bear the cold of our climate, by a gradual and cautious exposure to it *.



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* A plant of Scarlet Fuchsia, has for some years past remained in an open border in Dalbeth garden, and has annually produced abundance of seed; from these, young ones have been raised, which promise to be much more hardy than the parent plant. The *Fuchsia Lycioides*, *Mimulus aurantiacus*, *Leptospermum lanigerum*, *Aucuba japonica*, *Verbena triphylla*, *Lonicera implexa*, *Melianthus major*, and *Antirrhinum asarina*, have likewise withstood the winter in the same garden, but have not produced seeds, except the latter, which has sown itself so abundantly, as to have become almost a troublesome weed.

SECTION III.

ANOMALIES OF THE LEAF.

THE sap, after its absorption by the Root, passes through the sap-vessels in the wood of the Stem and Branches, till it reaches the Leaves, where it seems to undergo a chemical change, part going off by evaporation, and the remainder descending between the bark and alburnum to the roots.

There is apparently little or no difference in the composition of the leaves from the other parts of a vegetable, but the manner in which the vessels are disposed in them is very dissimilar; these entering the base of the leaf, spread in a reticular manner, anastomosing with one another, and upon

this their form is supposed to depend; but when cultivation, soil, outward circumstances, and other unknown causes, prevent this regular formation, these varieties are formed which are so frequently met with, and which we are now to enumerate.

THE singular delicacy of structure in leaves, and their numerous vessels, subject them to many varieties in number, size, situation, shape, and colour.

CHANGE from a poor to a rich soil, or a more abundant supply of nourishment, as it increases the number of branches, so it often produces additional leaves. The *Lysimachia vulgaris*, when cultivated in a rich soil, has the leaves increased in number from two or three to four and five; the same thing takes place in *Fuchsia coccinea*, *Lythrum salicaria*, and *Epilobium montanum*, which have frequently three leaves instead of two, and in this case, the stems are generally six, in place of four-angled; the *Anagallis arvensis*, has often four leaves at the joints, and the Privet, when vigorous,

may frequently be found with three leaves in a whorl. The Tway-blade (*Ophrys ovata**) is found with three, and the *Paris quadrifolia*, with five, six, and even seven leaves.

THE Naked Stalked Candytuft, (*Iberis nudicaulis*), as the name imports, has the stalk without leaves; when cultivated in gardens, it uniformly assumes them; and the same thing takes place in *Plantago major*, which is frequently found with leaves on the stem and even on the flower spike, Plate X. fig. 1.†; in like manner, the stalks of Tulips in rich borders, may frequently be seen furnished with one or more leaves ‡.

ACCIDENTAL fractures are frequently favourable to the production of leaves; a power to a certain degree is implanted in every living thing, to repair injuries sus-

* *Listera ovata*.

† On the other hand, the four-leaved Campion, (*Silene stellata*), is sometimes found in gardens with only two leaves, and cultivation does not increase the number.

‡ A plant of the Egyptian Papyrus, (*Cyperus papyrus*), at Dalbeth, has a common sheath-like leaf growing from the stem, besides the regular ones at the bottom of the umbel.

tained; thus part of a branch from a tree or shrub being broken, the regular flow of the sap is interrupted, an accumulation takes place at the wounded part, and the production of many new branches and leaves is the natural consequence.

This is singularly illustrated in some of the Sea Weeds; when *Fucus sinuosus*, by the violence of the storm, has the membranaceous parts destroyed, and only the nerves and fibres remaining, it becomes in a manner proliferous, and young leaves shoot forth in great abundance, giving it a quite different appearance to what it had before. The leaves of *Fucus sanguineus*, sometimes also become proliferous, a foot-stalk arising from the midrib, and forming a new leaf similar to, and nearly as large as that from which it issues*.

Major Velley mentions, that if *F. Vesiculosus* receives an injury or fracture, in any part of a healthy leaf, it constantly throws out abundance of new leaves from the injured part, and if even a small aper-

* Goodenough in Linnæan Transactions.

ture be made in the middle of it, a new leaf will be found to shoot out on either side.

FROM some malconformation of the vessels, or perhaps from their being ruptured, and running into one another from too great excess of moisture, leaves frequently appear in most unnatural situations. Thus several of the Roses are found with leaves growing out of the centre of the corolla, Plate IX. fig. 2.; and there is a curious variety of *Trifolium repens*, in which small heads of leaves grow out in every direction from the flower. Many of the Plantains are thus proliferous; a variety of *Plantago maritima* has leaves issuing from the whole flower-spike*, (Plate X. fig. 3.) and the Rev. P. Keith found several Pears, one of which is figured in his work, having several leaves resembling the proper leaves of the tree, but not so large, inserted half way down between the base and apex of

* When the top or part of the spike of this variety of *Plantago*, comes in contact with the soil, it frequently pushes out roots; and perhaps most proliferous plants have a tendency to do so. Plate X. fig. 3, a.

the fruit, and growing directly out of the fleshy part of it.

A GREAT excess of nourishment increases the size of leaves, as well as their number. The leaves on young trees are always larger than those upon old ones, the vessels being more pliant and less exhausted, take up and supply them with a greater quantity of sap. This is very conspicuous in young Poplars, Beeches, and Oaks; a leaf taken from a young Scarlet Oak, (*Quercus coccinea*), was ten inches in length, and they are sometimes found to extend to twelve inches. Persoon describes a Beech tree growing in the Duchy of Wirtemberg, which was remarkable for the extraordinary size of its leaves and fruit, called there, Mandelbuche, or Almond Beech, originating most likely from some peculiar richness in the soil. When the seeds of the variety cultivated in America, called from the size of its leaves, the Broad Leaved Beech, are brought to this country, and plants raised from them, the leaves are reduced to their original small size.

The variety of the Ivy called the Irish, has the leaves twice as large as the common one, and the Buck's-horn Plantain, (*Plantago coronopus*), which on the sea-shore, or amongst rocks, has the leaves small and succulent, when brought into the garden, has them much larger, and loses the succulency, which was only necessary for its existence in dry situations.

The great size which many of our culinary vegetables acquire, is owing entirely to the excess of nourishment which they receive by cultivation, and the skill of the gardener.

THE ABSENCE or presence of hairs or thorns, on leaves, is another anomaly which frequently presents itself. From the generally received opinion, that these are organs of absorption, it may easily be supposed that various changes will take place, from soil or situation making them more or less necessary to the plant.

The leaves of *Polygonum lapathifolium*, *Plantago coronopus*, *Myosotis arvensis*, Se-

dum villosum, *Thymus serpyllum*, *Asperula odorata*, *Scabiosa succisa*, and many of the Mints, &c. vary constantly in the degree of pubescence, as the soil in which they grow is more or less moist.

The Silver-weed, (*Potentilla anserina*), has the under side of the leaves generally covered with down, but in some situations it loses this entirely, and becomes altogether smooth; and the Oak-leaved Candle-berry Myrtle, (*Myrica quercifolia*), has the leaves sometimes quite smooth, and at other times downy.

The varieties in the leaf of the Common Holly are familiar to every one; sometimes they are found smooth, and at other times quite covered with prickles; sometimes these are only on the edges of the leaf, often over the whole surface; age in general deprives the leaves of these organs, the young shoots being found with prickly leaves, whilst the older ones are smooth, or nearly so. The Angelica Tree, (*Aralia spinosa*), has the leaves either armed with strong crooked spines, or smooth; and there is a variety of the Enchanter's Nightshade,



(*Circæa lutetiana*,) in which the indentments of the leaves are prickly.

WITH a few exceptions, the surface of leaves is flat and even, but this appearance is sometimes changed, and they become crisped and wrinkled, as in the Lettuce, Cabbage, Endive, and others; this proceeds from an excess or a deficiency in nourishment; in the first instance, part of the leaf becoming larger and more full than the rest, occasions that crisped or undulated appearance; and in the latter, want of nourishment partially contracting it, has the same effect *. This anomaly is prettily exemplified in the waved variety of the Hart's Tongue, (*Scolopendrium officinarum*,) the edge of the frond being remarkably full, occasions it to curl, as represented in Plate III. fig. 1. The Common Polypody, (*Polypodium vulgare*,) var. *Cambricum*, exhibits a somewhat similar appearance, and

* *Folium crispum*, cum peripheria folii major evadit quam discus admittit, ut undulatum fiat. Folia omnia crispa monstra sunt.

Folium rugosum, cum vena foliorum contractiones evadunt, quam discus, ut interjecta substantia adscendat. Phil. Bot.

in both cases the seeds on the back are invariably wanting, this variety being analogous to double flowers, where the parts of fructification are destroyed.

A remarkable circumstance attending this variety, though not peculiar to it alone, is, that it can be propagated by grafting or budding. It might be supposed, that when the superabundant nourishment was reduced, or in the case where the anomaly is produced by a deficiency, when a greater supply is afforded, that the leaves would assume their natural appearance; but this does not take place, the habit or disease that the plant has acquired, remains with it after the cause is removed. The variety called the Curled Leav'd Ash, is propagated by grafting or budding upon the common one, but it still retains its curled and dwarfish habit; and the same thing occurs in the Curled Leav'd Holly. The leaves of fruit trees are apt to be curled or blistered, from injuries sustained either by cold or by insects, and even in this case, the leaves retain very constantly their vitiated appearance. This is so well known,

that in propagating them, care is always taken not to take the bud or graft from a tree under the influence of this disease, as the shoots produced, invariably assume the same diseased appearance.

LEAVES, from climate, frequently become evergreen or permanent, instead of being deciduous; this may depend often upon the greater degree of heat keeping up a more constant flow of sap. In the green-house, many of our Ferns become evergreen. But plants of the same species, situated in the same soil, and under the same climate, are also subject to this anomaly; some accidental variety in the structure of their vessels, conveying the sap necessary to the complete developement of the leaves, more slowly in some cases than in others, may perhaps occasion this. The Swamp Magnolia, (*Magnolia glauca*,) in some instances loses its leaves annually, and in others, retains them for two, and even three years; and a variety of the Privet, called by way of distinction, the Evergreen Privet, and now much cultivated, retains

its leaves much longer than the common one*.

PLANTS of the same species, have the leaves in general similarly shaped, and should accidental circumstances alter in any degree their original form, an inclination is always perceived in them to return to it†.

No plant is more illustrative of this, than the variety of the Common Beech Tree, now much cultivated under the name of the Fern-Leaved Beech, the leaves of which are of the natural length, but not more than half an inch broad. But on all parts

* *Ligustrum Italicum*, Italian Evergreen Privet. Miller's Dictionary.

† There are some deviations from this rule, as in the White and the Paper Mulberry Trees, (*Morus alba* and *Papyrifera*,) which have the leaves either entire, or lobed and cut, upon the same plants; and an American plant, the Lion's Foot, (*Prenanthes serpentaria*,) has the leaves either simple, or variously divided and torn, not one leaf being similar to another.

Prenanthes, foliis dentatis asperis radicalibus palmato-sinuatis caulibus longe petiolatis sinuato-pinnatifidis subtrilobis: lacinia intermedia tripartita, summis lanceolatis, racemis terminalibus subpaniculatis brevibus nutantibus calycibus 8-fidis 12-floris. Pursh.

This curious plant, which grows freely in this country, and rises abundantly from seed, is in great esteem in America, as a cure for the bite of the Rattlesnake; the juice, boiled in milk, being taken inwardly, and the leaves applied to the wound.

of the tree may be seen leaves attempting to return to their natural shape; sometimes a single nerve pushes out from the main or middle one, and produces a segment attached to one side; occasionally one-half of the leaf is complete, whilst the other retains its anomalous appearance; and a broad naturally formed leaf, is not unfrequently found amidst the narrow ones, exhibiting more strongly by the contrast, this curious variety. These leaves, with their different shapes, are represented in Plate II.* The *Heracleum sphondylium*†, *Scolopendrium officinarum*, *Andromeda calyculata*, and *polifolia*, the Ash Tree, Myrtle, Orange, Lavender, and many other plants, have varieties with narrow leaves, the result originally perhaps of poverty in the soil, or some other cause, preventing the more perfect formation of the leaf; and they are propagated by grafting, or by a division of the

* For the impressions in the above mentioned Plate, taken from the leaves themselves, I am indebted to the ingenuity of James Hardie, Esq. of Lancefield.

† A plant of *Heracleum angustifolium*, Eng. Bot. cultivated in the garden at Dalbeth, after a year or two assumed completely the appearance of *H. sphondylium*, of which it is no doubt only a variety.

parts, the seeds generally producing plants of the natural figure *.

AN ANOMALY which is more difficult to account for, and which frequently takes place, is, where an entire leaf becomes divided, or one slightly serrated, becomes cut and jagged at the edges. The extension of the nerves, without a corresponding one of the cutis, or the reverse, from some unknown disarrangement in the vessels, is the immediate cause of this anomaly. Instances of this occur in the cut-leaved varieties of the Common Alder, (*Betula alnus* †,) *Ulmus campestris*, *Mespilus germanica*, *Lonicera periclymenum*, *Valeriana locusta*, and *Syringa persica*.

Simple leaves become sometimes so deeply divided, as to assume the appearance of compound ones. The Bastard Mountain Ash, (*Sorbus hybrida*,) has the

* Plants by cultivation, have their leaves sometimes increased in breadth, this is particularly the case in *Campanula barbata*.

† A variety of the Beech has been discovered in Bohemia, by Mr. Vignet, similar to the Cut-leaved Alder. He describes it, *Fagus sylvatica*, var. *laciniata*, foliis ovato—lanceolatis acuminate glabris, *profunde serratis*, serraturis acutis patentibus. Persoon in Lin. Trans.

leaves either all entire, or pinnate on the lower part, whilst the upper is confluent. Linnæus thought it a Hybrid, produced between *Pyrus aria* and *Sorbus aucuparia*; but as the plant is produced by seed, it is now considered a species*.

The Norway Maple, Elder, *Prunella grandiflora*, *Sonchus oleraceus*, Shepherd's Purse, Parsley, and many other plants, vary much in their leaves being more or less laciniated, and many of the Oaks have the leaves almost entire, or completely laciniated, on the same tree. The Water Oak, (*Quercus aquatica*,) varies in its leaves ad infinitum, according to the soil, scarcely one tree being found with its leaves like another, and the same tree is almost as variable in its different branches†. In pinnated leaves, the leaflets are sometimes increased in number, as in the Common Clover, which has sometimes four, and even five; it more rarely happens that they are

* There is still reason to doubt its being a distinct species; certainly the seeds occasionally produce plants similar to the mother, but often plants are produced with simple leaves, as in the *Pyrus aria*, or with pinnate ones, like the *Sorbus aucuparia*, and many partake of the shape of both.

† Pursh.

decreased in number, or become simple. Sir Edward Smith mentions a variety of the Heath Pea, (*Orobus tuberosus*,) with simple instead of pinnated leaves, and as if to make up for the loss thus sustained, they were five times as large as the natural leaflets; this plant, he remarks, could not by cultivation be made to flower*. There is also a variety of the Tulip Tree, (*Liriodendron tulipefera*,) with the leaves simple, instead of being lobed.

THE leaves of plants growing in water, vary much in their shape and appearance. The leaves of the Arrow-head, (*Sagittaria sagittifolia*,) that are covered with water, are linear, those above the water, arrow-shaped; the *Sisymbrium amphibium*, has the leaves more or less divided, as it is exposed or not, to the influence of water; and the Water Crowfoot, (*Ranunculus aquatilis*,) has the leaves roundish and entire, or lengthened out into long divided segments, according to

* A variety of the Ash Tree, now made a species, under the name of *Fraxinus simplicifolia*, is perhaps a similar instance; its specific distinction, *floribus simplicibus ovatis, profundi serratis*, founded entirely on the leaves, is very variable, as the leaves are found entire, lobed, and ternate, on the same tree.

the depth of the water or the rapidity of the stream in which it grows.

A CURIOUS appearance may sometimes be observed in the leaves of the Three-Leaved Vervain, (*Verbena triphylla*,) the middle nerve of the leaf, in place of running straight towards the point, and dividing it into two equal parts, separates into two branches, and in some cases, the point of the leaf is correspondingly divided, giving it the appearance of two leaves united together *. Plate VII. fig. 5 and 6.

THE LEAVES of most vegetables, when in a healthy state, are green, but accidental causes frequently combine to alter this. The most common anomaly in this respect, is when they lose their green colour, and become either partially or entirely white.

The green colour in leaves has been proved to depend upon their peculiar chemical constitution, and the changes they are subject to, upon the variation of such constitution. The decomposition of car-

* I have not perceived this variety in the leaf of any other plant, except the *V. triphylla*, in which it is not uncommon.

bonic acid, by the agency of light, says Mr. Ellis, seems to be the means employed by Nature, to accomplish this end; for by this mean the acid is not only withdrawn from its combination, and expelled, but the alkali is at the same instant, rendered predominant, and exists in a state fitted to exert its specific action on the colourable juices of the leaf; and this action it does exert, and the leaf, in consequence, exhibits a green colour. The colouration of the leaf therefore, is not immediately owing to the expulsion of oxygen, nor even to the subtraction of carbonic acid, but to the predominance of alkaline matter, which this subtraction of acid occasions; consequently, the verdure succeeds to the decomposition of carbonic acid, and the evidence of that decomposition is the expulsion of oxygen gas. To speak correctly therefore, it cannot be said that the green leaf affords oxygen, but that it becomes green when that gas is expelled.

The green colour in leaves is thus supposed to depend upon the predominance of alkaline matter, and that of white leaves, upon a deficiency of it; and experiments

have shown that green leaves afford a much greater quantity of alkali, than white or etiolated ones *.

The leaves of plants seldom become altogether white, they are either irregularly blotched, as in the varieties of *Hedera helix*, *Scrophularia aquatica*, *Ilex aquifolium*, *Myrtus communis*, *Aucuba japonica*, *Acer dissectum*, *Euphorbia amygdaloides*, *Antirrhinum majus*, *Rosa caroliniana*, &c.; striped longitudinally, as in *Plantago maritima*, *Arundo colorata*, *Dactylus glomerata*, *Cynosurus cæruleus*, *Iris pseudacorus*, *Lilium candidum*, *Allium cepa*†, and *Agave virginica*; or round the edges, as in the gold and silver-edged varieties of the Jasmine and Privet.

* Probably the same causes, under different modifications, may produce the variations in the smell and taste of plants. Dr. Robinson observed, that the leaves of Tansey, which had grown in a coal mine, and were white, afforded no aromatic smell, when rubbed between the fingers; but after they were planted in a place, exposed to light, their white leaves died down, and fresh green sprouts shot up, which possessed the smell and all the other properties of common Tansey. He repeated the experiment, with great care, on Lovage, on Mint, and other plants. They throve well in darkness, but with a blanched foliage, that had no resemblance to the ordinary foliage of their respective plants. When brought into day-light, they all died down, and the stocks then produced the proper plants in their usual dress, and having all their distinguishing smells. Black's Chem. Lectures.

† In a bed of onions, this season, I found a plant with the leaves beautifully striped with white, which was as luxuriant as the other plants.

The predominance of the acid or the alkali in particular parts of the leaf, produces these appearances, and also the modification of colour, as in the yellow blotched leaves of the *Aucuba**, and the red and blue ones, of some of the Balms and Mints. A very pretty variety of the Ivy-leaved Toad-Flax, (*Antirrhinum cymbalaria*†,) has its leaves variegated with pink, white, and green. The Clary varies, with the top leaves either red or purple, which are respectively produced by seed. Sometimes the leaves of plants are blotched with brown or black, as in the brown variety of the *Trifolium repens*, and in the leaves of *Arum maculatum*, *Orchis maculata*, *Hieracium maculatum*, &c. and these retain or lose this appearance, according to the soil in which they grow.

* Thunberg mentions several varieties of this plant, as with leaves of a brownish plain green colour, and of a lively green, variegated with white, &c. Dr. Sims says, that when exposed to our winter, it has the leaves with a greater proportion of green; this may probably depend upon the peculiar soil, as plants that have stood out of doors at Dalbeth, for some years, are in no respect altered, although some of them have been repeatedly cut down by the cold, and have their shoots and leaves constantly renewed every summer, whilst others, more hardy, have not been at all affected by the weather.

† *Linaria cymbalaria*.

There is a variety of the Olive, with the leaves entirely brown; and the copper-coloured variety of the Beech Tree, is now, from its general cultivation, well known to every one. In these instances, it is probable that the predominance of acid in the epidermis of the leaf, may be the cause of the red colour. Mr. Ellis, in treating of the difference of colour in the Green and Red Cabbage, says, in the Common Cabbage all the leaves which are exposed to light, acquire a green colour, while those in the centre or heart of the plant, have but little of a greenish hue, or are entirely white. These white leaves, however, contain the same colourable juices as those which are green, and the colourable matter is more or less distributed through the whole plant, and it is rendered white or green, according as the plant, or any part of it, is exposed to, or excluded from the light. This colouring matter is chiefly contained in the parenchyme, (or fleshy substance of the leaf,) and the colour is transmitted through the epidermis which invests it. In the red variety however, the colour

is not communicated by the juices of the parenchyme, but by the outer skin, or epidermis itself; while the juice beneath is yellow or white. The redness too of this plant, is seen both in those leaves which are secluded from light, and in those which are exposed to its action. The same colourable matter resides in the leaves of the Red Cabbage as in those of the Green, and the difference of colour in the two varieties is to be sought in that of the epidermis alone.

The same observations apply to party-coloured leaves, as in those of the *Amaranthus tricolor*, which are at the same time green, yellow, and red*.

Weakness or disease, is frequently the cause of blotched or etiolated plants, and although generally when the cause is removed, the anomaly disappears also, this does not always take place. A variegated variety of the Canary House-Leek, (*Sempervivum canariense*), was accidentally procured, from the circumstance of a branch having been partially broken, and the leaves

* Ellis' Inquiry.

becoming etiolated, by the supply of sap being abridged. In like manner, two or three small branches in the midst of a very bushy plant of the Common Elder, at Dalbeth, from want of light had become feeble and etiolated; on being cut off, and made to take root in a hot-bed, which they readily did, they were planted in a situation fully exposed to the light, but have ever since retained their etiolated appearance. To such accidents, we no doubt, owe many of those variegated plants, so much cultivated and admired by Florists; which can only be propagated by a division of the parts, plants raised from seed always returning to the original appearance of the species.

Change of soil, as it strengthens the etiolated plant, often either partially or altogether causes it to assume its natural colour. Miller mentions, of a variety of the Apple Tree with variegated leaves, originally produced by a poor soil, that when it was removed into a richer one, it became more vigorous, and lost its variegated appearance; and the variegated variety of the True Service Tree, (*Sorbus domestica*,) undergoes,

from a similar treatment, the same transformation; frequently a branch bearing larger and more healthy leaves, and of a green colour, may be seen amidst the variegated leaves of the Ivy, Myrtle, and other etiolated plants, occasioned by some unknown cause furnishing the branch with a greater supply of nourishment*.

SOME plants have the leaves naturally blotched or variegated, and it rarely happens that they lose this. Curtis, however, mentions a variety of the Milk Thistle, (*Carduus marianus*,) with plain green leaves, and the *Rumex sanguineus*, is sometimes found without the red veins, from which it takes its name.

* No rule can be laid down, however, with regard to these anomalies; change of soil, without regard to its richness or poverty, affecting plants very differently. In a rich border, a plant of *Arundo colorata*, had long retained its striped appearance; upon being transplanted into a poor clay soil, amongst trees, it very soon became green, and even more vigorous than it was before. On the contrary, another plant of the same grass, in the garden, has pushed out a great many green shoots, and the whole plant promises speedily to return to its original appearance; in this instance, more abundant nourishment seems to have been the cause of its change, as the green shoots are much more vigorous than the striped ones; in the former, the change has been affected from some peculiarity in the soil, as the nourishment was much curtailed.



J. Hopkirk. del.

EXTERNAL causes often alter the shape and appearance of leaves; injuries sustained by insects, either in search of food, or of a proper nidus for their eggs, produce very singular effects upon them. Like the buds and branches of plants*, the leaves are frequently found with hollow excrescences upon them, caused by insects of different species, but principally by the Gall-Fly, Plate XI. fig. 1, *b*. These tumours owe their origin to the deposition of an egg in the substance out of which they grow. This egg, almost too small for perception, the parent insect introduces into a puncture made by her curious spiral sting, and in a few hours it becomes surrounded with a fleshy chamber, which serves equally for shelter and food †.

Galls are either simple swellings of the leaf, on one or both sides, as those on many of the Willows, Plate XI. fig. 3. or they are entirely new formations, as those produced on the leaves of the Oak, Plate XI. fig. 1. which last are alone properly called

* Page 63.

† Introduction to Entomology, by Kirby and Spence.

galls. They are of various sizes, from that of a pin-head to that of a walnut; some of them are found only upon the nerves of the leaves, Plate XI. fig. 1, *c*, and others promiscuously over the whole surface, fig. 2. Some project from the under surface of the leaf, others from the upper, and many from both. Their shape is as irregular as their size; the galls upon the willow being generally of an oblong shape, fig. 3. and some of those on the Oak almost perfectly round, fig. 1. A very singular one may be found on the under surface of the Oak leaf, in great abundance, in the months of August and September, of a flat shape similar to a button, closely attached to the leaf by a very small footstalk, and covered round the edges with fine reddish or brown filaments, fig. 1, *d*. This pretty species owes its origin to a whitish worm, so very minute as not to be perceived without the assistance of a glass *.

* I have examined this species for some years, but have never been able to detect the perfect insects, although the galls are often so numerous as to cover the whole under surface of the leaves, and even to cluster over each other, from want of room. This, or a species analogous to it, is mentioned by Reamur, vol. iii. page 446.

On the leaf of the Alder, (*Betula alnus*,) galls are found, of an irregular shape, some of them sitting, and others upon short footstalks, fig. 2.

Many of these galls are used in dyeing and in medicine, and those found on the leaf of the Ground Ivy, (*Glechoma hederacea*,) are eaten by the country people in France, like those on the branches of some of the Sages; they are used when young, as they become dry and stringy from age.

Excrescences similar to those made by the Gall-Fly, are also caused by other insects; those upon the Lime-Tree, (*Tilia europæa*,) are supposed to proceed from a species of Beetle, (*Curculia*.) Some owe their origin to Moths, and others, to two-winged flies, as the galls of the Thistle, which are caused by the *Musca cardui*. The *Aphis Pastinacæ* occasions the leaves of the Parsnip, (*Pastinaca sativa*,) to expand into red finger-like cavities; and the *Aphis bursariæ*, inhabits the angular utriculi on the leaf-stalks of the *Populus nigra* *.

* Kirby and Spence.

The large protuberant flesh-coloured follicles, tapering towards the sides, found upon the leaves of the Mastick and Turpentine Trees, (*Pistacia lentiscus*, and *Terebinthus*,) are caused by an insect of the same kind, the *Aphis Pistaciæ*, so called from its constantly inhabiting plants of the genus *Pistacia*, the excrescences formed by different insects, being seldom found promiscuously on different plants, but each choosing a particular plant, to which it constantly resorts, guided by an instinct implanted in it.

THE terminal leaves of plants, as the Ground Ivy, Wild Thyme, and Germander, (*Veronica chamædrys*,) may frequently be noticed glued together, and covered with down; this is caused by the larva of some insects lodged within, extracting the sap, and giving a morbid action to the juices. Plate XI. fig. 4. shows a plant of *Veronica chamædrys* thus disfigured, *a*, the natural size, and *b*, the magnified appearance, of the orange-coloured worms found upon opening the leaves.

LEAVES are frequently found with circular or triangular shaped pieces cut out of them, variously rolled up and glued together*, and marked with brown zigzag lines; but as these appearances have no connection with their growth, they cannot be included amongst the Anomalies of the Leaf, the principal of which have been already enumerated.

* Some insects of the genera, *Tortrix* and *Tinea*, says Kirby, merely connect together with a few silken threads, several leaves, so as to form an irregular packet, in the centre of which the little hermit dwells. Others confine themselves to a single leaf, of which they simply fold one part over the other. A third description form and inhabit a sort of roll, by some species made cylindrical, by others, conical; these are formed by the insect fixing her silken threads from one side of the leaf to the other, afterwards pulling them with her feet, till she forces the sides of the leaf to approach, which she then fastens together with shorter threads. If the insect finds that one of the large nerves is so strong as to resist her efforts, she weakens it by gnawing it half through. The leaves of the Lime and Beech Trees, and of many shrubs, may be frequently found thus rolled up.

The larva of many insects feed upon the pulpy substance, or parenchyma, included between the upper and under cuticles of the leaves of plants, and cause those curious brown zigzag lines frequently seen upon the leaves of the Dandelion, Lilac, and many of the Roses; this subterranean gallery serves the insect for a habitation as well as for food, and the larva may often be found inhabiting one end of it. See Introduction to Entomology, by Kirby and Spence.

SECTION IV.

ANOMALIES OF THE FLOWER.

THE FLOWER, properly defined, is that part of a plant which is intended by Nature, and is necessary, for the production of its species by seed.

A perfect flower consists of a calyx, or outward covering, being a continuation of the bark, generally of a green colour; a corolla, or interior covering, commonly coloured *, and immediately surrounding the reproductive organs; the nectary, a glandular body for the purpose of secreting a particular sweet fluid from the other

* A flower, or any part of it, is said to be coloured, when it is of any other colour than green.

juices of the plant, and the Pestil, situated in the midst of the Stamens; which two last mentioned parts of the flower are alone essentially necessary to its perfecting seed.

The anomalies that take place in these various parts, are now to be considered, and we shall commence with those of the calyx.

As in the other parts of a plant, the Calyx, by cultivation or abundant nourishment, is sometimes greatly increased in size; this takes place frequently in some of the Grasses. The calyx of some species of *Agrostis*, becomes elongated, thickened, and of the texture of a leaf, and the same thing takes place in the Common Quaking-grass, (*Briza media*.) This is generally accompanied with a similar change in the corolla. In the Rye-Grass, (*Lolium perenne*,) the calyx may frequently be found greatly enlarged and flattened, which appearance it retains when cultivated in the garden, as it sometimes is on account of its singular appearance.

FREQUENTLY the calyx is found with one or more additional leaves or divisions, but it seldom loses its regular number. A very singular instance of a multiplied calyx, is mentioned by Linnæus, as occurring in the Clove, (*Dianthus Caryophyllus*,) and figured in Curtis' Botanical Magazine. The four scales at the base of the calyx, are multiplied, sometimes to the entire exclusion of the other parts of the flower, forming a four-sided spike the length of a finger, somewhat similar to an ear of wheat*. The *Calla palustris* has no corolla, and only a large spreading permanent one-leaved spathe, of a white colour; when this plant is cultivated, it sometimes has two spathes instead of one, which has repeatedly occurred in a plant cultivated in Dalbeth garden. The natural appearance is repre-

* In hoc squamæ calcynæ augentur in infinitum, ut constituent integram spicam, modo singulare. Phil. Bot.

A monstrosity occasioned by the multiplication of the parts of the calyx, is so extremely rare, that Linnæus remarked he had hardly seen another instance of it; and he thought it of sufficient importance to induce him to affix to this variety the trivial name of *imbricatus*. *Dianthus caryophyllus* (✓) *imbricatus*. Wheat-ear Carnation, Bot. Mag.



J. K. Kirk. del.

sented in Plate V. fig. 1. and the variety, fig. 2. *

The divisions of the calyx vary frequently in number, as in the Small-flowered Bell-flower, (*Campanula lobeloides*), where the calyx has either three, four, or five segments.

OCCASIONALLY the calyx branches out into leaf-like divisions, and is more or less spinous or hairy, according to the soil in which it grows. The first of these anomalies may frequently be seen in several species of the Rose, and the other is exemplified in the Siberian Mother-wort, (*Leonurus sibiricus*), which is found with the calyx either spinous or entirely smooth †.

In general the calyx is of a green colour‡, but it often happens, that losing its natural

* Willdenow says, that during long continued wet weather, the Dame's Violet, (*Hesperis matronalis*), from superabundance of food, frequently bears flowers when the corolla has begun to form a second calyx.

† Exotic Botany.

‡ Some plants have the calyx naturally coloured. The calyx of *Fuchsia coccinea*, and *Punica granatum*, and *nana*, is red; that of *Daphne mezereum*, pink; of *Daphne laureola*, and *Tropæolum majus*, yellow; *Statice sinuata*, blue; and of *Calla æthiopica*, and *palustris*, white. The

hue, it assumes either partially or entirely, that of the corolla. We cannot produce these varieties, which have their origin from causes yet unknown, we can only take advantage of them and propagate them.

When in consequence of cold or wet seasons, the corolla of the Wood Crowfoot, (*Ranunculus auricomus*), becomes diminished in size, or is altogether wanting, the leaves of the calyx increase in size, and assume, either partially on one side, or entirely, the yellow colour of the petals. In the same manner, the tubular perianth, in many varieties of *Primulæ*, becomes enlarged, and acquires the yellow or red colour of the corolla. This variety in the *Polyanthus* is well known to Florists, under the name of Hose-in-hose, and has the appearance of one

petal-like calyx of *Hortensia*, is first greenish, and then rose-coloured or blue, it afterwards assumes a violet shade, and then a dirty white or purplish red, as it draws near the termination of its existence. But the most remarkable instance of transition of colour, takes place in the calyx of the Changeable Corn-flag, (*Gladiolus versicolor*), whose perianth is brown in the morning, but during the day the colour gradually changes, and towards evening it is of a clear blue; during the night it again assumes its former colour, and this change regularly takes place every day, till the flower is faded, which is in six or eight days. As it approaches its termination, the brown colour becomes more permanent, and at last remains fixed. Andrews.

corolla included within another. Sometimes the border alone is coloured, the under part of the perianth remaining green.

The Three-leaved Green-stalked Arum, (*Arum triphyllum*), has the spathe sometimes purple instead of green*; and a variety of the common Broom is cultivated, with a purple calyx. Palas found on the banks of the Volga, the Woolly-leaved Anemone, (*Anemone patens*), with the perianth (or more properly speaking, the calyx-like involucre) blue, white, and sometimes yellow.

THE Floral Bractæ frequently increase in size, and assume a different colour, often that of the corolla, as in *Scilla nutans*, where they are either blue, white, or pink†; the scarlet variety of the Purple Monarda, (*Monarda fistulosa*), has the floral

* Some authors make the Purple-stalked Arum, a distinct species, under the name of *Arum atrorubens*.

† In a variety of this plant found in Bothwell woods, the bractæ were much increased in size and number, and of a green colour. Flor. Glot.

The involucre in plants varies much in size, or in the divisions of its leaves, and sometimes it is entirely wanting, as in some of the umbelliferous plants.

leaves of the same colour, whilst those of the Scarlet Bartsia, (*Bartsia coccinea*), which are naturally scarlet, sometimes become yellow, without any corresponding change in the corolla.

OF all the individual parts of a plant, that which is most liable to vary, and which presents us with the greatest number of anomalies, is the Corolla. Whether this takes place from the greater delicacy of its structure, or from the juices circulating in the component parts of the whole flower, being apt from accident to run into each other, occasioning these transformations so frequently met with, or from other unknown causes, we are still in ignorance.

The anomalies that present themselves, are either those of deficiency, when part of the corolla is wanting; those of redundancy, when the parts are increased; those of shape, in which the form is altered from its primitive figure; or those of colour, when it is changed from its original hue.

It seldom happens that a plant which

is naturally provided with a corolla, is entirely divested of it; instances of this anomaly, however, take place in *Ranunculus auricomus**, *Campanula pentagona*, *perfoliata*, and *media*, *Tussilago anandria*, and *Erodium maritimum*†.

The *Viola odorata*, *palustris*, and *canina*, have their late flowers sometimes without petals, and a plant of the latter which I found without petals, and transplanted into the garden, continued so for two years, during which time it regularly produced seed‡.

The Corn Bell-flower (*Campanula hybrida*) has, in one part of Germany, no petals, but is said to have them in France and Italy; *Ruellia clandestina*, is so named, because it sometimes has flowers wanting the corolla; and some other plants, as

* Linnæus (fancifully enough) says, that in the season for the leafing of trees, the *Ranunculus auricomus* wants the petals; in the season of their flowering, it has two or three; and in the season for the fruit, the usual number.

† It is seldom that the *Erodium maritimum* entirely wants the petals, but in some situations they become so reduced in size, as not to be perceived without the most minute inspection.

‡ This plant has now regained the petals, owing probably to the richness of the soil.

Ipomæa, *Lychnis*, &c. are liable to the same anomaly*.

A COROLLA consisting of several petals, is often deficient in the regular number, as in the Corn Adonis, (*Adonis autumnalis*), which instead of five, has frequently only three or four petals, and the large Yellow Uvularia, (*Uvularia grandiflora*), a plant of the class Hexandria, and order Monogynia, has frequently only five petals†, while the *U. sessilifolia* has never less than six, the number natural to both.

PLANTS of the class Syngenesia, or with compound flowers, have often part of the corolla reduced in size, or altogether wanting. This generally takes place in the florets of the circumference, which are either very small, as in *Pyrethrum parthenium*, Plate VI. fig. 1. c; or entirely lost, fig. 1. a. The same anomaly is found in *Senecio jacobæa*, *Anthemis arvensis*, *cotula*, and *nobilis*, *Centaurea nigra*, *Inula dysenterica*, and *Aster tripolium*.

* Willdenow.

† In this case it has five stamens and two styles. Exotic Bot.

WITH a single exception, I do not know of any instance of a plant which is naturally without a corolla, acquiring one. Adanson remarked, in the green-house of the Duke D'Ayen, a *Bocconia*, with a corolla, although the plant in general has none*.

A MUCH more common anomaly, is when the petals of the corolla are unduly augmented. This may either take place partially, without affecting the other parts of the flower, or to their entire exclusion. In the first case, the flower is said to be Multiplicate, and in the latter, Full †; and these are called by Florists, though evidently most improperly, Semi-double and Double flowers. Polypetalous flowers are the most subject to become multiplicate, the instances of monopetalous ones becoming so, being more rare. The common Primrose is sometimes found with one corolla within another,

* *Bocconia*. Gen. Char. Calyx 2-leaved. Corolla, none. Style, bifid; berry, dry, one seeded. Willd.

† Distinguo Multiplicatum florem a Pleno, quod in pleno Corolla ita multiplicata est, ut staminibus vix ullus locus. Multiplicatus vero prædicatur de serie duplici, triplici, aut quadruplici, corolla auctiore. Phil. Bot.

which, with the coloured calyx that generally accompanies this modification of flower, gives it the appearance of having a triplicate corolla. Of multiply polypetalous flowers we have many examples, as *Cistus helianthemum*, *Anemone nemorosa*, *Sanguinaria Canadensis*, *Tormentilla officinalis*, *Hibiscus mutabilis*, *Tulipa sylvestris*, *Cheiranthus cheiri*, *Hesperis matronalis*, *Mathiola incana*, and many others. In these instances, the stamens and pistil not being injured, the seeds may be produced as in single flowers; but it is a very remarkable fact, that the seeds produced by these multiply or semi-double flowers, generally speaking, produce plants with similar flowers, or at least produce a greater number of plants with this anomaly, than would be produced from the seeds of regular flowers*.

* Florists assert, that single flowering plants, growing beside double ones of the same species, are so infected by them, that their seeds will produce double flowers. If this is really the case, which there seems some reason to doubt, it is a very inexplicable circumstance; it is more probable, that these double flowers are in general the offspring of semi-double flowers, or have become so, from the richness or some peculiar quality in the soil.

The semi-double variety of *Hibiscus mutabilis*, frequently produces seeds, and these almost always, in their turn, produce semi-double and double flowers, which the seed from single flowers seldom do, and the same thing may be observed in Stocks, Wall-Flowers, &c.

Mirbel says, that the seeds of simple flowers which have been gathered in barren or uncultivated places, and sown in cultivated ones, produce simple flowers, but that when sown again, though even in a poor soil, they frequently produce double ones. Thus it appears that the influence of the soil in making flowers double, is exerted not so much upon the individual, as upon the embryos which come from it. This vitiated habit in plants, for all these anomalies not being natural, can only be considered as such, seems to be communicated to their offspring, in the same manner as hereditary diseases are transmitted in the human species.

WHEN the anomaly of the augmented corolla is so far increased as entirely to exclude the stamens and pestil, the plant necessarily becomes barren, and can only be propagated by means of cuttings, or by dividing the root.

Cultivation is the great origin of these varieties; plants in their native situations seldom deviate from their proper figure;

and when they do so, it is generally owing to some peculiar richness in the soil*. Near Bagnares, in the Province of Bigorre, in the plains at the foot of the Lyeris, a mountain covered with the richest pastures, Mirbel found the *Anemone*, the *Ranunculus*, and the *Rose*, perfectly double, like those cultivated in our gardens, owing to the extreme richness of the soil in which they grew; and in this country in rich pastures, the *Cardamine pratensis* may frequently be found with double flowers.

THE monopetalous corolla may become full in two ways, either by the transformation of the stamens and pestil into petals, or from the petal being cut and divided into a great number of laciniaë, occupying

* Many ridiculous causes are given by old authors, to account for double flowers; and even old Parkinson, who combats some of the absurd speculations of his times, denies that flowers become double, except in their native place, or that they ever became so through the skill of man. "Although I doe confesse and acknowledge," says he, "that I thinke some constellations, and peradventure changes of the moone, or coniunctions of planets, or some other starres, or celestial bodies, &c. were appointed by the God of nature, as conducing and helping to the making of those flowers double, that nature hath so produced."—Parkinson's *Paradisus Terrestris*.

the whole interior of the flower. The Arabian Jasmine, (*Jasminum sambac*,) and Wild Hyacinth, (*Scilla nutans*,) become full by the first of these methods, and the Snapdragon, (*Antirrhinum majus*,) by the other. The Snapdragon, has in its natural state, a monopetalous ringent corolla, divided into five parts, but in the full flower, it is split down to the base into numerous unequal segments, irregularly twisted and bent, and the stamens and pestil completely lost. These laciniae are firmly attached to the perianth, and do not fall off as the natural corolla does, the perianth, and often the blunt spur-shaped nectary retaining the natural appearance. This singular anomaly is figured in Plate VII. fig. 1. *a*, the natural shaped corolla, *b*, the irregular one*. This

* This is an instance of a Monopetalous Corolla becoming, as it were, Polypetalous; but Bauchine and Morison mention a singular variety of the Soapwort, (*Saponaria officinalis*,) in which the leaves surround the stem, and the blossom becomes *Monopetalous*, but generally split and divided, and destitute of the other parts of fructification. Ray considered it as a mule plant, between a *Gentiana* and the Soapwort.

Other plants become full by the division of the corolla, somewhat similar to the Snapdragon, as the Spanish Broom, (*Spartium junceum*,) *Coronilla*, *Anthyllis*, *Clitoria*, &c. Pursh mentions, that the great Virginian Convolvulus, (*Convolvulus panduratus*,) is cultivated in the American gardens with double flowers.

plant, like many other double flowering ones, is more tender than those with single flowers, and requires the shelter of the green-house during winter, a proof that these varieties are often occasioned by weakness or disease.

A PLANT of the common Wild Hyacinth, (*Scilla nutans*,) now before me, which was removed from its native place into the garden, has undergone a double transformation, and become full by both the preceding methods. Instead of six, it is furnished with twenty stamens, and of these twelve have been changed into blue petal-like leaves, nearly two inches long, bearing the abortive anther, attached to them on one side. The regular corolla being at the same time much increased in length, and split into many segments, and the bracteæ, as if to correspond with the singular appearance of the flower, are also much longer than usual.

This appearance may almost constantly be found in a greater or less degree in the Wild Hyacinth when cultivated.

THE MOST common method by which a flower becomes full, as before observed, is by the transformation of the stamens into petals, and the greater number of stamens that a flower has, the more subject it is to this anomaly, flowers with few stamens rarely becoming so. The garden Tulip when cultivated in too rich a soil, frequently assumes this appearance. In some plants only one or two of the stamens branch out into petals, bearing often the abortive anther on their summit, or more commonly attached to one side. In others, the whole stamens, and even the pistil undergoes this metamorphosis, and the plants in consequence become sterile. These spurious petals are seldom so regularly shaped as the true ones, but are generally more narrow, and frequently irregularly jagged, betraying thus, their unnatural origin. The process is the same in many other polypetalous plants; and in this manner are produced many of those beautiful flowers the ornament of our gardens, so much valued and so successfully cultivated by Florists,

but which conceal in fact under their beauty, a real degradation.

The number of petals in full flowers is sometimes very great; the Tulip has often thirty or forty; the *Corchorus japonicus*, has a hundred; the *Ranunculus asiaticus*, two hundred; and the garden Pæony, a variety of the wild one, (*Pæonia corallina*,) which has naturally but five petals, may be found with considerably above two hundred *. These petals generally decrease in size as they approach the centre of the flower, the inner ones being almost linear.

THE Tulip becomes full in another way, which I have only observed in it, and in the White Lily, (*Lilium candidum*.) The bark immediately behind the corolla, branches out into irregular petal-like leaves, sometimes similarly coloured with the

* Flowers sometimes become so full, as to burst the calyx, as in those Carnations and Pinks, called Bursters; and in Mr. Austin's nursery, in this neighbourhood, amongst his excellent collection of Roses, I observed one, where the petals were so excessively numerous, and so closely folded together, as to have the consistency of a solid ball, and from that circumstance, the flower was unable to expand.

corolla, but often betraying their origin, by being striped or blotched with green, and it is not uncommon to see one or more of these party-coloured leaves situated a considerable way down the stalk. In the White Lily, spurious petals of a greenish white colour are formed behind the regular ones, which are much reduced in size; and from the lowermost petals being the longest, whilst the others gradually decrease in size, a pyramidal spike of barren flowers is formed, several inches in length, all vestiges of the stamens and pestil being lost.

It is worthy of remark, that the petals that are thus formed *below* the corolla, generally partake in a greater or less degree of the colour of the bark, as if only an unnatural continuation of it, whilst those formed *within* the corolla, assume its colour, except that they are sometimes slightly shaded with that of the anthers attached to them. In the same way, the petals formed in the *centre* of a full flower by the transformation of the pestil, are generally greenish.

As FULL flowers originate from too great a superabundance of moisture, or from some peculiar richness in the soil, when deprived of these, they frequently return to their pristine appearance. A very double variety of the common Red Rose, (*Rosa officinalis*,) was planted in a border where the soil was very poor from want of manure, and much exhausted from the number of trees and shrubs that grew in it. The flower soon became reduced in size, and the number of petals decreased yearly; the third season after its removal from the garden, it had only one or two more than the regular number, and the stamens and pistils had re-appeared.

Plants however, differ much in this particular, some having a much greater tendency to assume their natural figure than others. The *Corchorus japonicus* has been tried in every situation, without showing any disposition to become single, neither is the single-flowered plant to be found in this country, and few people have seen that well known plant the Bachelor's Buttons, with single flowers, a proof of the con-

stancy with which it retains its unnatural habit.

THOSE plants that have nectaries in the form of a spur or cup, as the Columbine and Daffodil, become multiplicate or full, either by increasing the number of the nectaries or of the petals. In the Columbine, (*Aquilegia vulgaris*,) the spur-shaped nectaries are increased to six, eight, or even ten, and these are generally inclosed one within another, attached by the upper end. Plate VIII. fig. 2. A variety now and then is found, where the nectaries are not thus inclosed within each other, but are each separately clustered round the flower; this, however, occurs much more rarely than the other.

In the Narcissus tribe, the cup-shaped nectaries increase in size and number, so as sometimes entirely to exclude the parts of fructification; in some instances, it is accompanied with a corresponding decrease in the petals, in others, they remain unaltered.

ON THE other hand, the petals often

become more numerous, and the nectary is entirely destroyed. This may frequently be perceived in *Aquilegia vulgaris*, *Delphinium ajacis*, and *grandiflora*, in some of the Violets, and in the double Indian Cress. The Columbine occasionally exhibits both these anomalies in the same flower, one half having the nectaries increased, to the exclusion of the petals, and the other half having the petals increased, to the exclusion of the nectaries; the Narcissus is also found with both petals and nectaries increased in number.

COMPOUND flowers, or those which have a number of flowers invested by a common calyx, become multiplicate or full, in a manner peculiar to themselves*.

* Compound flowers are either

SEMIFLOSCULOUS, (*Flos semiflosculosus*), when the general flower consists entirely of tongue-shaped, or strap-shaped florets, (*corollæ ligulatæ*), Plate VI. fig. 1. *b*, as in *Tragopogon*, *Scorzonera*, *Leontodon*, *Hieracium*, &c.

DISCOID, (*Flos discoideus*), consisting entirely of tubular florets, (*corollæ tubulosæ*), Plate VI. fig. 1. *a*, as in *Cynara*, *Carduus*, &c. or,

RADIATE, (*Flos radiatus*), having tubular florets in the middle or disc, and tongue-shaped ones in the circumference or ray, Plate VI. fig. 2. and 4. as in *Senecio*, *Aster*, *Doronicum*, *Tagetes*, and *Bellis*. Willd.



J. Hopkirk del.

A radiate flower becomes double, either by the tubular florets in the centre increasing in size, and excluding partially or entirely, the ligulate ones in the circumference, or by those in the circumference taking place of those in the centre.

The most frequent anomaly is when the florets in the ray displace those in the disc, in part or altogether. Both these may frequently be observed in the different varieties of *Bellis perenne*, *Achillea ptarmica*, *Senecio elegans*, Plate VI. fig. 3. *b*. *Pyrethrum parthenium*, fig. 1. *b*. *Calendula officinalis*, *Helianthus annuus*, and *multiflorus*, and many others; in the *H. multiflorus*, the double variety is so common, that a plant with single flowers is seldom met with. In general the change takes place gradually, the florets increasing from the ray, and displacing by degrees the centre ones; but it sometimes happens very irregularly, a ligulate floret or two appearing amongst the tubular ones, as in *Conyza Thapsoides*, *Helianthus annuus*, and *Chrysanthemum leucanthemum*, Plate VI. fig. 2. *b*, the regular petals, *a*, the anomalous ones.

The ligulate florets after assuming the place of the tubular ones, are for the most part, regularly disposed or imbricated over one another; but there are instances where this is not the case; in a singular variety of the Wild Chamomile, (*Matricaria chamomilla*,) they stand upright, and are twisted into every direction; and in a variety of Daisy, where the under side of the petals is red, and the upper white, the whole flower has a speckled appearance, owing to the irregular twisting of the florets.

WHEN a radiate flower becomes full by the disc or centre, the tubular florets increase in size, and lose the stamens, and the florets in the ray disappear*. This takes place in *Bellis perenne*, *Achillea ptarmica*, *Matricaria chamomilla*, *Chrysanthemum indicum*, and *Pyrethrum parthenium*, Plate VI. fig. 1. *a*; and those flowers, as *Carduus*, *Cynara*, &c. which have only tubular florets, become full by the florets increasing in

* When this anomaly occurs in a flower, it is denominated by Florists, QUILLED, as *Bellis perennis*, var. *fistulosa*, Quilled Daisy, Quilled Indian Chrysanthemum, &c.

size, in which case they are generally barren.

Willdenow says, that in semiflosculous flowers, (as *Scorzonera*, *Lapsana*, and *Tragopogon*,) although the lingueform corolla, style, and stamens, remain natural, the stigma becomes divided, and of the same length with the corolla, and in this case they never bear seeds *.

BUT it sometimes happens in compound flowers, that part of the florets are lost without any change taking place in the remainder, as in the varieties of *Anthemis nobilis*, and *Pyrethrum parthenium*, frequently met with in gardens, where the

* From natural flowers of the same external appearance, full flowers may be easily distinguished, by the larger corolla, and by the want of seeds. If the radius is full, then no disc can be seen, and such a flower gets much the appearance of a semiflosculous flower, from which however it may be distinguished at once, by there being not the least appearance of stamens. From the simple full flower, the full compound flower differs in this point, that there is a style attached to each petal. The radius of a simple radiate flower remains the same in a full radiate flower. If the radius is beset with prolific female flowers, then the full flower, consisting of mere lingueform flowers, is provided with prolific styles, and may without difficulty, if there be any natural plants in its neighbourhood, bear ripe seeds. If the radius, on the contrary, consists of barren female flowers, we commonly find them to be the same in the full flower. Willdenow.

florets in the ray are much reduced in size, or entirely wanting. On the other hand, the Nodding Bur-Marygold, (*Bidens cernua*,) is occasionally found with radiated florets in the circumference, and the *Bel-
lis perenne* is often seen with the ligulate florets increased in number, whilst those in the centre remain natural, in which case it may produce seeds, Plate VI. fig. 4. *

A greater or less degree of nourishment, or some particular modification in the juices, as in the other varieties of plants, is no doubt the primary cause of these anomalous developements, but the more immediate operations of these causes, remain still to be discovered †.

* A singular kind of multiplicate flower is mentioned by the Rev. P. Keith, in an individual flower of *Primula veris*, containing two ovaries, two styles, two stigmas, and eight anthers, complete, with the rudiments of a ninth, and the calyx and corolla divided into nine segments.

† In double flowers, the smell or flavour is generally much increased, which frequently arises from the multiplication of the petals. These containing in general more of the volatile oil, the source of the odoriferous emanations, than the other parts of a plant, being increased in number, the odour is also increased. It has been said indeed, that abundant nourishment, by filling the pores with juice, and enabling the plant to secrete more of the oil from whence the perfume arises, may tend to heighten its flavour. Thus the odour of Thyme is much stronger when cultivated in a garden. But the reverse of this frequently takes place. The Water Cress, (*Sisymbrium nasturtium*,) and *Mentha rubra*, have a much more aromatic smell,

The following plants vary with MULTIPLICATE or FULL flowers, commonly called SEMI-DOUBLE and DOUBLE flowers:—

Achillea ptarmica, Sneezewort Milfoil.

Adonis autumnalis, Pheasant's-eye Adonis.

Adonis vernalis, Spring Adonis.

Agrostemma coronaria, Common Rose Campion.

when growing in dry, than in wet soil, and in fact no general rule can be laid down as to these differences. The herb Robert, (*Geranium Robertianum*,) in America wants the heavy unpleasant scent, so remarkable in the British species *. The Common Frog-bit, (*Hydrocharis morsus ranæ*,) varies with scented or scentless blossoms, and the same thing takes place in the Persian Cyclamen, (*Cyclamen persicum*.) Almost every Mint, says Sir Edward Smith, has a peculiar smell of its own, in its original wild state, by which it is known from its congeners. Thus *Mentha arvensis*, by its smelling like blue mouldy cheese, is distinguished from the other whorled Mints. But many Mints are capable of acquiring an entirely new smell, by change of soil, a dry situation, or by some change in their constitution which we do not understand. Thus the smell of Sweet Basil is acquired by some, that of the Orange by others, and one or two acquire a sweet smell, which belongs also to a sweet variety of the garden Thyme, called in Norfolk, where it is common, Frankincense Thyme, and the Pepper-Mint, the taste and smell of which is so well known, is by those who cultivate it for medical purposes, taken up and transplanted every three years, otherwise it degenerates into the flavour of Spear-Mint, from which nevertheless it is specifically different †. There is in every plant, when in a natural state, a particular constitution which enables it to apply the juice it imbibes to the formation of its own qualities. Hence, says Dr. Hunter, “a mass of innocent earth can give life and vigour to the bitter Aloe, and to the sweet Cane, to the cool Houseleek, and to the fiery Mustard, to the nourishing Wheat, and to the deadly Nightshade.” Accidental circumstances may sometimes alter or destroy those peculiar qualities, but the cause being removed, the plant will generally resume its natural properties.

* *Pursh.*

† *Sir E. Smith in Lin. Trans.*

- Amygdalus persica*, Peach Tree.
Amygdalus communis, Almond Tree.
Amygdalus pumila, Dwarf Almond.
Amygdalus nana, Common Dwarf Almond.
Anemone Hepatica, Hepatica.
Anemone hortensis, Garden Anemone.
Anemone sylvestris, Snow-drop Anemone.
Anemone nemorosa, Wood Anemone.
Anemone thalictroides, Meadow-rue-leaved Anemone.
Anemone uniflora, Single-flowered Anemone.
Anthemis nobilis, Common Chamomile.
Anthemis arvensis, Corn Chamomile.
Antirrhinum majus, Great Snap-dragon.
Aquilegia vulgaris, Common Columbine.
Aquilegia canadensis, Canadian Columbine.
Arbutus unedo, Common Strawberry Tree.
Bellis perennis, Common Daisy.
Bidens cernua, Nodding Bur-marygold.
Calendula officinalis, Common Marygold.
Calla palustris, Marsh Calla.
Caltha palustris, Common Marsh Marygold.
Camellia japonica, Japan Rose.
Campanula persicifolia, Peach-leaved Bell-flower.
Cardamine pratensis, Cuckoo Flower.
Cheiranthus Cheri, Wall-flower.
Chelidonium majus, Common Celandine.
Chrysanthemum coronarium, Garden Chrysanthemum.
Chrysanthemum leucanthemum, Ox-eye Daisy.
Chrysanthemum indicum, Indian Chrysanthemum.
Cistus helianthemum, Dwarf Rock Rose.
Clematis viticella, Purple Virgin's Bower.
Clematis florida, Japan Virgin's Bower.

- Clerodendrum fragrans*, Fragrant Clerodendrum.
Colchicum autumnale, Common Meadow Saffron.
Convallaria majalis, Lily of the Valley.
Convolvulus panduratus, Great Virginian Bindweed.
Conyza thapsoides,
Corchorus japonicus, Japan Corchorus.
Crataegus oxyacantha, Common Hawthorn.
Crataegus crus-galli, Cockspur Hawthorn.
Crocus vernus, Spring Crocus.
Delphinium ajacis, Upright Larkspur.
Delphinium grandiflorum, Great-flowered Larkspur.
Dianthus barbatus, Sweet William.
Dianthus chinensis, China or Indian Pink.
Dianthus caryophyllus, Carnation.
Dianthus deltoides, Maiden Pink.
Erica vulgaris, Common Heath.
Erica cinerea, Fine-leaved Heath.
Erysimum barbarea, Yellow Rocket.
Fritillaria imperialis, Crown Imperial.
Galanthus nivalis, Common Snow-drop.
Gardenia florida, Cape Jasmine.
Geranium pratense, Crowfoot-leaved Geranium.
Geranium sylvaticum, Wood Geranium.
Geum rivale, Water Avena.
Helianthus annuus, Annual Sun-flower.
Helianthus multiflorus, Many-flowered Sun-flower.
Hesperis matronalis, Dame's Violet.
Hibiscus rosa-sinensis, China Rose Hibiscus.
Hibiscus mutabilis, Changeable Rose Hibiscus.
Hyacinthus orientalis, Garden Hyacinth.
Hydrocharis morsus ranæ, Common Frog-bit.
Jasminum sambac, Arabian Jasmine.

- Lilium candidum*, White Lily.
Lilium martagon, Purple Martagon.
Lychnis chalcedonica, Scarlet Lychnis.
Lychnis flos-cuculi, Ragged Robin.
Lychnis viscaria, German Catchfly.
Lychnis dioica, Red-flowered Catchfly.
Mathiola incana, Stock. Gilly-flower.
Matricaria Chamomilla, Wild Chamomile.
Myrtus communis, Myrtle.
Narcissus poeticus, Poetic Narcissus.
Narcissus pseudo-narcissus, Daffodil.
Narcissus jonquilla, Jonquil.
Nerium oleander, Common Oleander.
Nigella damascena, Fennel-flower.
Pœonia officinalis, Common Pœony.
Pœonia corallina, Entire-leaved Pœony.
Pœonia albiflora, White-flowered Pœony.
Pœonia humilis, Dwarf Spanish Pœony.
Papaver somniferum, White Poppy.
Papaver orientale, Oriental Poppy.
Pelargonium zonale, Horse-shoe Crane's-bill.
Polyanthes tuberosa, Common Tuberose.
Primula vulgaris, Common Primrose.
Primula veris, Cowslip.
Primula villosa, Hairy Auricula.
Primula auricula, Auricula.
Prunella vulgaris, Common Self-heal.
Prunus padus, Bird Cherry.
Prunus cerasus, Cherry Tree.
Punica Granatum, Common Pomegranate Tree.
Pyrethrum parthenium, Common Feverfew.
Pyrethrum inodorum, Scentless Mayweed.
Pyrus malus, Apple Tree.

- Ranunculus Ficaria*, Pilewort.
Ranunculus aconitifolius, Fair Maids of France.
Ranunculus asiaticus, Persian Ranunculus.
Ranunculus acris, Upright Ranunculus.
Rosa sulphurea, Double Yellow Rose.
Rosa cinnamomea, Cinnamon Rose.
Rosa spinosissima, Scotch Rose.
Rosa carolina, Burnet-leaved Rose.
Rosa villosa, Apple-bearing Rose.
Rosa sinica, Chinese Rose.
Rosa provincialis, Provins Rose.
Rosa centifolia, Hundred-leaved Rose.
Rosa gallica, Officinal Rose.
Rosa damascena, Damask Rose.
Rosa rubiginosa, Sweet-briar Rose.
Rosa muscosa, Moss Rose.
Rosa moschata, Musk Rose.
Rosa multiflora, Bramble-flowered Rose.
Rosa canina, Dog Rose.
Rosa semperflorens, Ever-blowing Rose.
Rosa indica, Blush Chinese Rose.
Rosa alba, White Rose.
Rosa Banksiæ, Lady Banks' Rose.
Rubus fruticosus, Common Bramble.
Sagina procumbens, Procumbent Pearl-wort.*
Sanguinaria canadensis, Canadian Blood-wort.
Saponaria officinalis, Common Soapwort.
Saxifraga granulata, White Saxifrage.
Scilla nutans, Wild Hyacinth.†

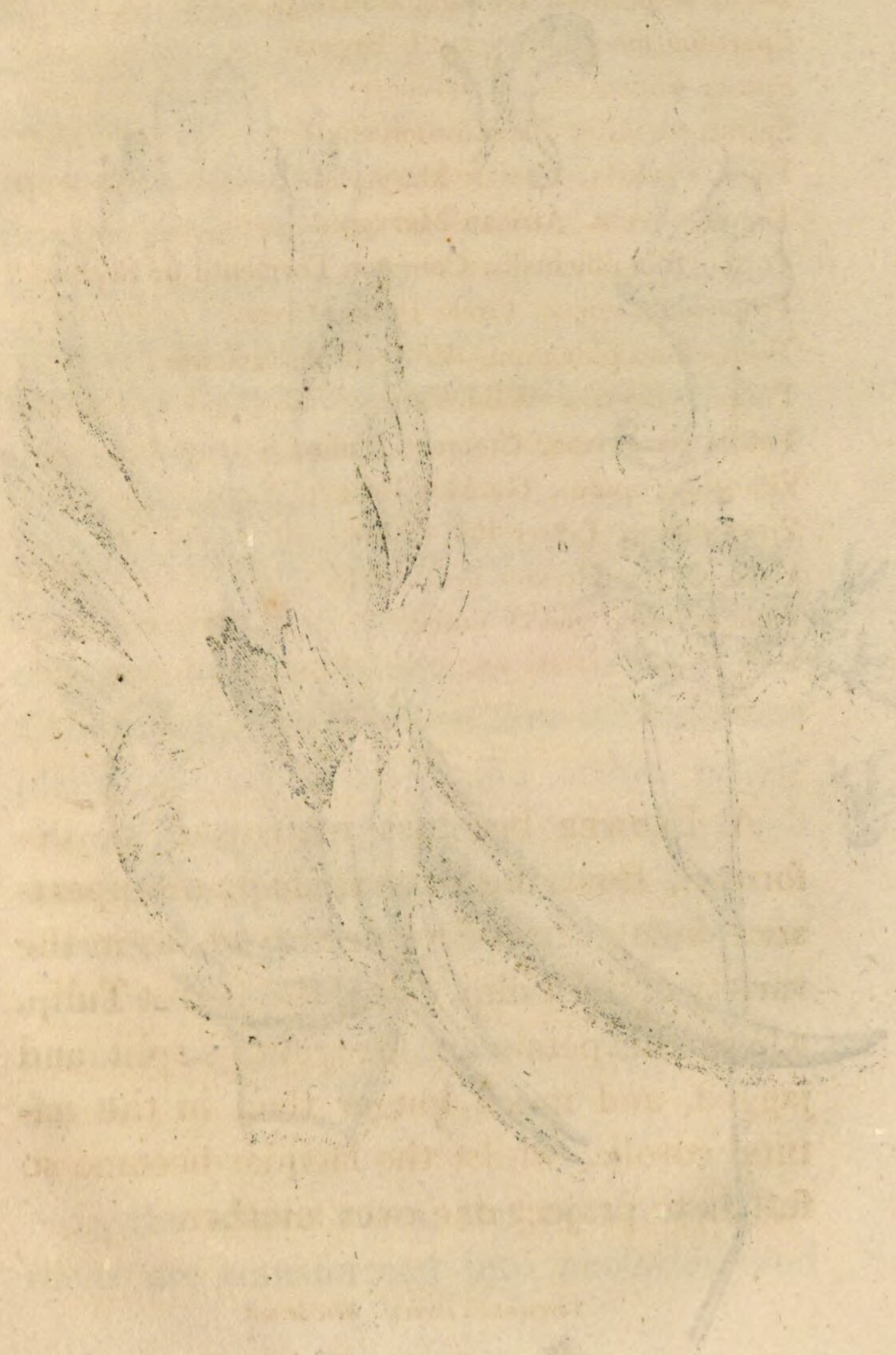
* This beautiful little variety is at least biennial, although in its single state it is generally called annual.

† *Hyacinthus non scriptus*, Hort Kew.

Senecio elegans, Purple Jacobea.
Serissa foetida, Japonese Serissa.
Silene vespertina, Evening Catchfly.
Spartium junceum, Spanish Broom.
Spiræa filipendula, Drop-wort.
Spiræa ulmaria, Meadow-sweet.
Tagetes patula, French Marygold.
Tagetes erecta, African Marygold.
Tormentilla officinalis, Common Tormentil or Septfoil.*
Tropæolum majus, Great Indian Cress.
Tropæolum pinnatum, Winged Nasturtium.
Tulipa sylvestris, Wild Tulip.
Tulipa gesneriana, Common Tulip.
Viburnum opulus, Guelder Rose.
Vinca minor, Lesser Periwinkle.
Vinca major, Greater Periwinkle.
Viola odorata, Sweet Violet.

A FLOWER becomes monstrous or deformed, from the natural shape or appearance being altered or destroyed, as in the variety of the Tulip, called the Parrot Tulip, where the petals are irregularly split and jagged, and much longer than in the natural corolla, whilst the laciniae become so full as to project one over another.

* *Tormentilla erecta*. Willdenow.



Jan. 1891



J. Koppink del.

A remarkable appearance in an individual plant of this variety, is figured in Plate VIII. fig. 1. *a*. Part of the petal had extended itself into two long tubes, similar to the horn-like nectaries of some plants, and these upon examination were found to secrete honey, as in regular nectaries, "dulci distendunt nectare cellas," a striking proof of the analogy subsisting between the different parts of a flower, and with what ease, in particular circumstances, they may be converted into each other. Nor is this the only instance of the kind; we have already seen that the petals of some flowers are readily changed into nectaries, as in those of the Columbine; but the anthers of the same plant may often be found either totally changed into little nectaries, or having them attached to their sides, and these spurious nectaries are perfectly similar in their construction, and secrete honey in the same manner as the regular ones. Plate VIII. fig. 3.

In the above cases, the petals and stamens are transformed into nectaries, and

these anomalies are by no means rare, but Withering relates a still more uncommon one, where the petals are transformed into stamens. This occurs in the Black Currant, where, when the stamens are more than five, the petals decrease, so that when there are ten stamens, there are no petals.

The florets of the Black, or Lesser Knapweed, (*Centaurea nigra*), are sometimes found irregularly laciniated, and a variety of Tulip, called the Silken, very common in the gardens of Constantinople, the roots of which have been brought to this country by Lady Liston, has the petals cut into stripes like ribbons, giving it, in addition to its brilliant colours, a strikingly beautiful appearance.

THE natural divisions of the corolla are in some instances increased in depth, as in *Azalia periclymena*, whose corolla is sometimes found divided down to the bottom, and in the variety of the Small Bindweed, (*Convolvulus arvensis*), mentioned by Ray, and since found by Sir Edward Smith, the corolla is deeply divided into five segments.

PLANTS have either regular flowers, as in the Catchfly, the Rose, or the Lily, or irregular ones, as in the Snapdragon and the labiated plants. The transformation of regular flowers into irregular ones, is not uncommon in radiated flowers, which have the tubular florets, as already mentioned, changed into ligulate ones. It rarely happens that this takes place in polypetalous flowers; Mirbel relates an instance in *Le Triphasia*, a tree of the family Aurantia of Jussieu; its flowers have generally three regular petals and six stamens, but it is found with five stamens and one large vaulted petal.

MANY instances may be given, where irregular flowers become regular. The flower of the Common Toad-flax, (*Antirrhinum linaria**,) instead of its ringent tetandrous corolla, with a single corniculated nectary, is found with a regular, monopetalous, pentandrous tube, from the base of which proceeds five nectaries, corresponding with the

* *Linaria vulgaris*.

divisions of the reflexed margin of the corolla. Plate VII. fig. 2. *b*, *c*, the natural flower is represented at *a*.

The genus *Antirrhinum*, is very subject to this appearance, it is found in *A. linaria*, *monspessulanum*, *spurium*, *repens*, and *elatine*, and in almost every plant of this genus when cultivated in the garden, some flowers may be found with two or more spurs, which is generally the commencement of this singular anomaly, fig. 3. *b*.

Other irregular flowers are likewise subject to this, as *Bignonia*, and *Mimulus*, and Sir Edward Smith mentions having found a variety of the common Hemp-Nettle, (*Galeopsis tetrahit*), whose terminal flowers were regularly four-cleft, and salver-shaped, with four equal stamens, whilst the rest had their proper form; he likewise observed a solitary flower of the Pasture Louse-wort, (*Pedicularis sylvatica*), which instead of its proper ringent form, with two long and two short stamens, had a salver-shaped regular corolla, with six stamens, four of which were longer than the rest. The same thing takes place in *Chelone bar-*



J. M. Opland del.

bata, *Teucrium campanulatum*, and *Cleonia lusitanica*.

This kind of monstrosity is called by Botanists *Peloria*, and Linnæus constituted this variety of the *Antirrhinum linaria*, a distinct genus, under that name*, which however, cannot be admitted, as the characters upon which it is founded, are evidently the result of accident, and of course, not permanent.

THE Guelder Rose, (*Viburnum opulus*), in its natural state has its terminating solitary cymes composed of many radiant white flowers, the inner ones small and perfect, resembling those of the Elder, whilst those in the margin are large, flat, and abortive, that is, want the stamens and pestil. But it sometimes happens that these large abortive petals are increased to the exclusion of all the perfect ones, and from their number and size, the flower assumes a round form, constituting that beautiful variety, from its form and whiteness called

* *Amœnitates Academicæ, Desertatio Botanica de Peloria.*

the Snow-ball Tree. The same appearance is found in the Hydrangea, (*Hydrangea hortensis*,) the petals being often all barren, and much increased in size.

A VERY remarkable species of deformity, and different from any of those already enumerated, is mentioned by Willdenow. In one of the Umbellatæ, just beneath the umbella, a compound flower was found resembling that of *Bellis perennis*, and a similar flower was found by Gesner on a *Ranunculus*. It is a striking phenomenon, to meet on the stem of a flowering *Ranunculus* and of an Umbella, the flower of a Daisy. Once it was thought, that the stems of both were grown together, and that the stem of the Daisy had grown and unfolded itself in the first, like a grafted sprig. But later observations have shown, that this flower is not the perfect flower of the *Bellis perennis*, but merely something like it. It is a congeries of many flowers of the *Ranunculus* or Umbella imperfectly unfolded, which have retained their small

size and yellow colour, and are inclosed in a number of whitish petals *.

FLOWERS, like the leaves, are frequently subject to deformity caused by insects. Thus the flowers of *Veronica chamaedrys*, instead of opening, sometimes remain shut, but swell out in an unnatural manner; this is occasioned by a small bug, (*Cimex*), which has laid its eggs in the flower, and the larvæ sucking the juice, causes the anomaly. In like manner, the flowers of the Toad-flax are sometimes so disfigured by insects, that the natural form is scarcely to be recognised, the whole spike appearing only as if a bundle of whitish wrinkled scales, often covered with hairs; the same thing sometimes happens in the Flix-weed, (*Sisymbrium sophia*), the flowers of which, from injuries sustained by insects, become clustered together into a shapeless mass, in which two or three calyx-like leaves and some petals are scarcely to be distinguished †.

* Gessner, Dissert. de Ranunculo bellidifloro. Willd.

† Gilibert.

It is also not uncommon for galls to be formed upon the flowers; the Catkins of the Oak have little round galls resembling Currants, sometimes intermixed with the flowers, and at other times entirely displacing them *.

THE next anomaly that presents itself, is that of the Proliferous Flower.

When one flower grows out of another, it is called proliferous, and this takes place either from the centre of the flower, or more frequently from the sides. The *Ranunculus*, *Anemone*, *Geum rivale* †, *Cardamine pratensis*, some of the Pinks, and many of the Roses, may frequently be

* Reamur.

† A singular proliferous variety of *Geum rivale*, is described by Gilibert, in his *Histoire des Plantes d'Europe*, as follows:—"Les feuillets du calice agrandis; les six extérieurs plus courts, dentés; les six intérieurs très-grands, dentés et lobes, imitant la collerette feuillée de l'*Anemone ranunculoides*; environ trente pétales insérés sur le calice, en spatule, à onglets longs, d'un jaune-paille, à lames bariolées de plusieurs étamines entremêlées avec les pétales. Du centre de cette fleur monstrueuse, s'élève un péduncle à la hauteur de six lignes, portant un calice à plusieurs segments dentés mais sans pétales et sans étamines, il enveloppe une multitude de pistils; à styles hérissés, rougeâtres au sommet. Il est démontré rigoureusement que ce monstre appartient au *Geum rivale*, vu qu'on trouve sur la même racine deux autres tiges à fleurs non prolifères, semblables à celles de la Benoîte des rivages, (*Geum rivale*), les pétales dans ces fleurs, sont de couleur paille, verdâtre, sans lignes rouges."



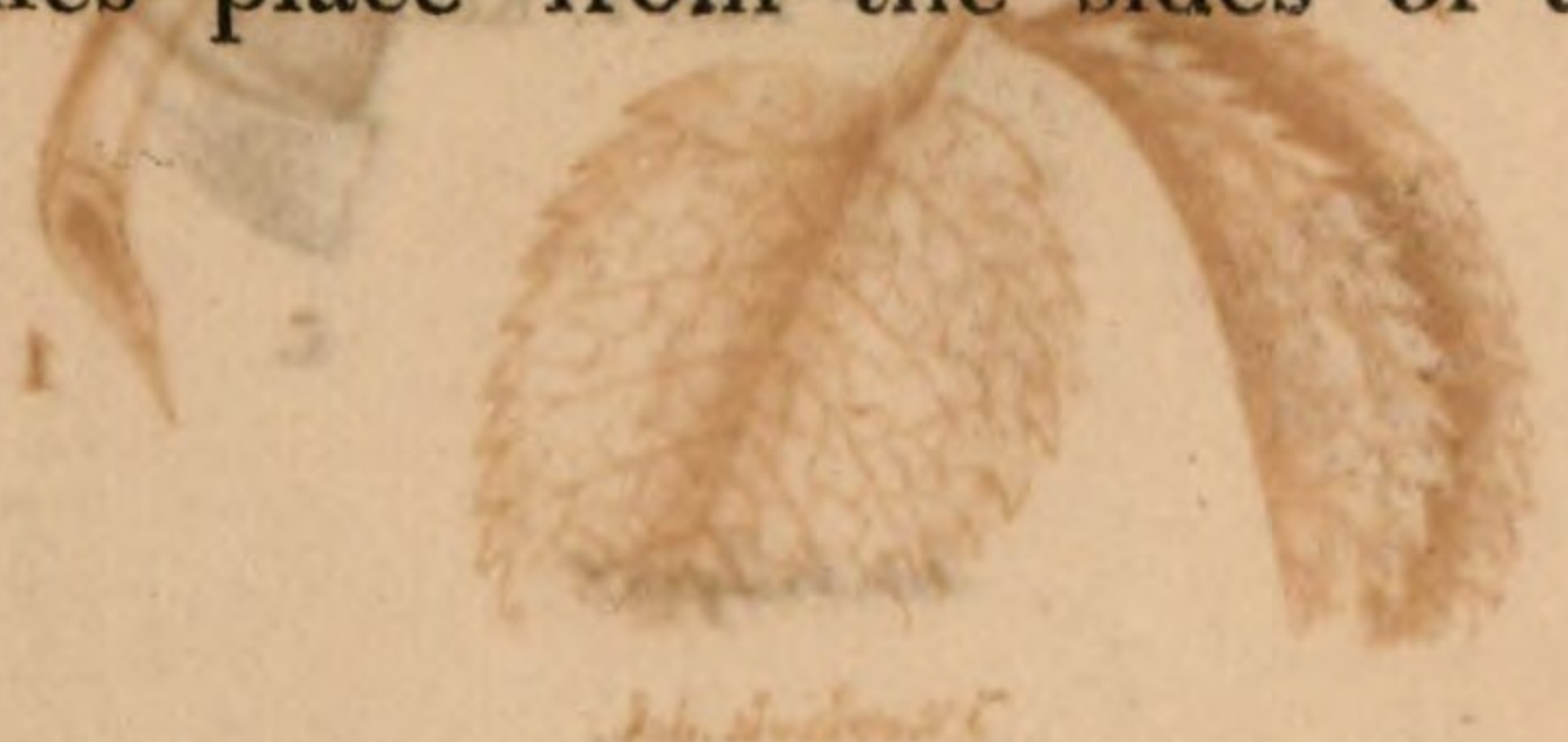
J. Sloper del.

found with a smaller flower growing immediately from the centre of the natural one. In general, the proliferous stalk is solitary, and bears one flower; but it occasionally happens, that more than one stalk is protruded; in Mr. Austin's Nursery, I met with a Rose bush, the whole flowers of which had a tendency more or less to this deformity, and from one to eight flowers issued from the centre of each of the regular ones.

A Rose bush at Dalbeth exhibits this anomaly annually, producing in some instances only a stalk furnished with leaves, Plate IX. fig. 2. and in others a stalk bearing a small Rose, fig. 1. In general these proliferous stalks have an irregular appearance, and are surrounded with a few bractæ or leaflets, fig. 1. *a*.

It rarely happens that the flower is more than once proliferous, although sometimes a few greenish shoots appear in the centre of the upper Rose.

In compound flowers, the anomaly generally takes place from the sides of the



flower, small heads, or umbels proceeding from the common calyx. The variety of the *Bellis*, cultivated under the name of the Hen and Chicken Daisy, is an instance of this species of deformity, and it is likewise found in the Hawkweeds, the Marygold, and in the Sweet Scabious.

In the Botanic Garden at Edinburgh, I met with a plant of the Daisy, where both these varieties occurred, some of the flowers having smaller ones growing from the centre, and others from the sides, and in some instances from both.

The flower-spike of the Ribwort Plantain, sometimes becomes proliferous, a number of small spikes growing from the main one, and often lesser ones again from them, Plate X. fig. 2. A plant in Dalbeth garden has retained this appearance for many years, whilst one removed into a poor soil, returned immediately to its original form.

IN Umbellate Plants a new umbel sometimes issues from the centre of the original ones, as in *Cornus**, and in the Cow Pars-

* Rev. P. Keith.



J. Hopkirk. del.

nip, (*Heracleum sphondylium*,*) leaves are found growing out of the flowers, as before mentioned in the Rose; this takes place also in the Clover, (*Trifolium repens*,) in some of the Plantains, as *Plantago lanceolata*, *maritima*, and *major*, where leaves issue from the stalk or flower-spikes, Plate X. fig. 1. and 3, and in the Bird's-eye Primrose, (*Primula farinosa*,†) where heads of leaves are produced amongst the flowers. In speaking of the anomalies of the leaf, we have found that leaves occasionally become proliferous, and bear other leaves ‡; a similar instance is recorded of the petals of a wild Rose, which bore small ones growing out of them.

In general, proliferous flowers are barren §, their reproductive faculties are either destroyed by this method of flowering, or the anomaly is the consequence of their being unable to perfect seed, and proceeds from an attempt to propagate themselves by another method.

* Willdenow.

† Flora Londinensis.

‡ Page 78.

§ Willdenow mentions having once seen a Lemon, on the apex of which a stem rose, bearing another Lemon.

WHEN a plant instead of bearing a perfect flower, has the place of the fructification supplied by a leafy bud, which pushes out roots and becomes a new plant, it is called Viviparous, and is a species of anomaly nearly allied to the last.

This takes place principally in Alpine plants and grasses, which from their situation and exposure to cold and wet, are prevented from perfecting their seeds; it is frequent in *Aira cæspitosa*, and *lævigata*, *Festuca vivipara*, *Poa aquatica*, *alpina*, *fluitans*, and *flexuosa*, *Phalaris phleoides*, and *Cynosurus cristatus*. In some of these, the actual transformation of the glumes into leaves, may be seen from the awn remaining at the top of the leaf.

As in some other anomalies, this is more or less permanent in different plants. The *Aira cæspitosa vivipara*, may be cultivated in almost any soil or situation, without losing its anomalous appearance, the young plants raised from it, regularly producing viviparous flowers; the same thing takes place in *Aira flexuosa*, figured in Plate VIII. fig. 4.; *a* the natural floret, *b*, *c*,

viviparous ones, and the *Festuca vivipara* is so constant in its form, as to constitute a species under that name.

On the contrary, some plants readily return to their original appearance by change of soil; a viviparous variety of the Little Bulbous Rush, (*Juncus uliginosus*), when transplanted into the garden, assumed in the course of a summer its natural appearance.

SOME plants are partially viviparous. The Alpine Bistort, (*Polygonum viviparum*), has only the lowermost flowers viviparous, and these vary in number according to the soil; in wet seasons, the Leek (*Allium porrum*) has frequently viviparous bulbs intermixed with the flowers. Many other species of *Allium* become thus viviparous, and the variety in some of them is very permanent. The Onion generally cultivated in gardens, under the name of the Tree Onion, and sometimes, though improperly, called the Canada Onion, is a viviparous variety of the Common Onion (*Allium cepa* *.) Nicholson, in the British Encyclopædia, gives the

* Bot. Mag.

following account of it. "This," says he, "deserves to be cultivated, both as a curiosity, in producing the Onion at the top of the stalk, and for the use of the Onions, especially for pickling, in which they are excellent, and superior in flavour to the Common Onion. It is perennial, and is propagated by planting the bulbs in spring and autumn. Either the root bulbs or those produced on the top of the stalk, being planted in a bed of good earth, in rows a foot asunder, six inches distance each row, and two or three inches deep, they shoot up leaves and stalks in the spring and summer, and produce the bulbs for use in July and August, and the root bulbs remaining, furnish a production of top bulbs annually in that season. The root bulbs increasing by off-sets, may be taken up occasionally at the time the stem decays in autumn, or once in two years, in order to separate the off-sets, and plant them when necessary."

In this variety there are commonly a few flowers intermixed with the bulbs, and the small bulbs often branch out and bear smaller ones in their turn. The variety

cultivated under the name of the Potato Onion, propagates itself by bulb tubers from the root, as is the case in many other bulbous rooted plants *.

BULBS are also formed in the ovaries of some plants, instead of seeds; this may be seen in *Pancratium Americanum*, *Agave fœtida*, and *vivipara*, and *Crinum Americanum*. The common Wheat sometimes assumes a similar appearance, and, to a casual observer, appears viviparous, which however is not the case; in very wet seasons, the seeds when ripe, begin prematurely to germinate, and push out the young leaves before leaving the seed vessels, a circumstance but too common in such seasons as the present †. It is not always easy to distinguish

* Page 55.

† The seeds of some plants naturally germinate before leaving the parent plant, as in the Egyptian Lotus, (*Nymphaea nelumbo*), the seeds of which frequently begin to grow before leaving the pericarp. The fruit of the Mangrove Tree, (*Rhizophora mangle*), a native of the East and West Indies, germinates, according to Browne, "within the cup, and grows from the top downwards, until it acquires a due degree of weight and perfection, when it falls off; and as the root is always thickest, and hangs lowest, it drops in that direction, and is thus received in its natural position, in the mud below; the leaves immediately unfold, and in a few minutes, a per-

between a bulb formed in the ovary of a plant, and a seed. "A bulb," says Mirbel, "separated from the mother plant, is in fact similar to a detached bud, it is not an entire individual, but only a part of one, it is an imperfect being which requires a new vegetation to render it complete, that is, to produce roots, which it wants. The seed, on the contrary, has already within itself all the essential parts which are necessary to constitute an individual plant, and only requires their developement. The bulb requires a new creation to complete it; the seed, only the growth of its parts already in existence."

BULBS, similar to those in the ovaries, are formed on the stems of plants, in the axils of the leaves, or on the leaves themselves. Sometimes this is natural to the plant, and at other times it is acquired from some peculiarity in the soil, or from accident. Mr.

fect plant is seen, sometimes ten or twelve inches in length, which soon begins to shoot its roots, and push its growth, like the parent stem, for the germ is frequently a foot in length before it falls, and has always two leaves at top, but these are folded up and inclosed within the cup while it continues on the tree."

Wedgewood mentions, that upon some plants of *Dahlia sambucifolia*, and *bidentifolia**, which grew very luxuriantly, but had few flowers, he found large tubers or bulbs formed upon the stem, whilst those which were not so strong, and flowered freely, had none; and the same gentleman found on the ribs of a decayed leaf of a species of *Ornithogolum*, from the Cape, numerous little bulbs, produced by the superabundant sap which had not an opportunity of wasting itself in forming seeds, the flowers having been regularly cut off as they decayed †.

Bulbs are formed in the axils of the leaves in *Dentaria bulbifera*, *Ranunculus ficaria*, *Ixia bulbifera*‡, *Saxifraga bulbifera*§, and *Lilium bulbiferum*, and *tigrinum*. In a rich soil these bulbs are increased in number, and in wet seasons, it is not uncommon to see in the Tiger spotted Lily, three, four, or five in the axil of each leaf, which not unfrequently push forth roots

* *Dahlia superflua* and *frustranea*. Hort. Kew. *Georgina purpurea* and *coccinea*. Willd.

† Wedgewood, in Transactions of Horticultural Society of London.

‡ *Sparaxis bulbifera*.

§ *Saxifraga bulbifera*, supposed to be only a variety of *S. granulata*.

and young leaves, before leaving the parent plant.

Viviparous plants are for the most part barren, being enabled to propagate themselves by other means, the necessity for ripening seed seems obviated. A plant of the Toothwort, (*Dentaria bulbifera* *,) which has been many years in Dalbeth garden, never produced a single seed, and the Tiger Lily will seldom bear seed, unless the bulbs are taken off as soon as they appear, in which case seed is produced.

PLANTS become sterile from many causes, some of which have been already enumerated, as in double, deformed, and proliforous flowers; where the stamens or pestil, or both, are excluded or destroyed, or where they are enabled to propagate themselves by some other means than by seed, as in viviparous plants.

In like manner, plants that increase much by the roots, are seldom found with perfect seeds, as *Tussilago*, *Vinca*, *Lysimachia*, *Convolvulus sepium*, *Convallaria multiflora*, and many of the *Menthæ*; in the

* *Cardamine bulbifera*, Hort Kew.

last, the stamens become reduced in size, and the anthers shrivelled up *. The common Skull-cap, (*Scutellaria galericulata*), which increases much by the root, seldom perfects all its seeds, and the Hooded Milfoils, (*Utricularia vulgaris*, and *minor*), which increase by the roots, or by the upper part of the stem falling off, and taking root in the mud †, are seldom found to flower.

REMOVAL from a warm to (a colder climate ‡, or a change of soil, is some-

* The stamens and pestils vary in size and number, without otherwise affecting the plant; the *Lythrum hyssopifolia*, and *salicaria*, have sometimes only five or six stamens, instead of twelve; the *Queria canadensis* has from two to five, the *Myosurus minimus*, from five to twelve, and the *Azalia periclymenoides*, from five to twenty stamens. The *Stellaria media*, *Sarothra gentianoides*, and many others, vary constantly in the number of their stamens.

The generic character of the *Saxifraga stellaris* is lost, when that plant is cultivated, the capsule becoming three-beaked, and having two cells, instead of being two-beaked and one-celled, and the *Lychnis quadridentata*, varies with three, four, and five styles.

The *Lychnis dioica* has in general the sexes distinct, but Gilibert found plants with hermaphrodite flowers, others which had some flowers hermaphrodite, and some with stamens; in some there were only eight stamens, and in others only two styles, and in one plant all the flowers had six styles.—Hist. des Plantes d'Europe.

In the *Caricæ*, the flowers are male or female, but Mr. Sowerby met with a plant of *Carex lævigata*, where the flowers were hermaphrodite.

† Flora Glottiana.

‡ Page 71.

times fatal to the fertility of plants. Linnaeus informs us, that the Thick-leaved Nitraria, (*Nitraria Schoberi*), a native of Siberia, which grows on the salt plains between the Irtis and Ob rivers, and on the banks of the salt lakes in that country, remained destitute of flowers in the Swedish gardens for twenty years, and was at length rendered fertile by scattering salt round its roots, and the Egyptian Ricotia, (*Ricotia Ægyptiaca**,) by no management could be made to flower, till the clay of the Nile was mixed with the soil in which it grew, when it fully succeeded †.

THE number of flowers on a plant, varies greatly from soil and cultivation. The Two-flowered Narcissus (*Narcissus biflorus*) is found with only one flower, and sometimes with three ‡; and the same

* *Lunaria Ægyptiaca*. Spec. Plant.

† Amœn. Acad.

‡ Mr. Salisbury supposes *Narcissus biflorus* to be a hybrid plant, as he has never found the ovarium to contain seeds, even in native specimens.

thing takes place in the Two-flowered Linnaea, (*Linnæa borealis*.) On the high mountains of Westmoreland, *Campunula rotundifolia* has seldom more than one flower, and the Alpine Pink, (*Dianthus alpinus*), in its native state, has always a single flower, a character which cultivation easily deprives it of, in common with many alpine plants. In like manner, *Arethusa verticillata*, *Tulipa sylvestris*, *Fritillaria meleagris*, and *Anemone sylvestris*, have occasionally two flowers instead of one*, and the Bloody Crane's-bill, (*Geranium sanguineum*), has sometimes two flowers from the joints, in which case the bracteæ are also double. A plant of the Common Dandelion which I accidentally found, had two flowers, the stalk dividing a little below the top.

The *Lilium bulbiferum* has naturally only two or three flowers; by cultivation these are increased sometimes to above an hundred.

* In the genus *Crocus*, two fertile bulbs are generally evolved from the summit of the mother bulb, but these sometimes grow into one, when the number of leaves and flower-stalks are doubled, although those of the root remain the same. Bot. Mag.

Some of the Grasses, as *Lolium perenne*, have sometimes two or more spikes of flowers, and *Polygonum amphibium*, when growing in water, is subject to the same anomaly. The superabundant nourishment with which, from particular situations, they are supplied, is the cause of the exuberance which they exhibit, and the departure from their natural appearance.

THE VARIETY OF COLOUR in the vegetable kingdom, with the many modifications to which it is subject, constitutes one great source of beauty in flowers, and the different colours incident often to the same species, and even plant, have been eagerly sought after, cultivated, and improved, forming the principal attraction of our flower gardens,

— mixta rubent ubi LILIA multa alba ROSA.

But colour in vegetables is of so fluctuating a quality, and depends so much upon light, air, soil, health, and other unknown

causes, that no specific distinction ought to be founded upon it.

Flowers are most commonly either Yellow, White, Blue, Red, Purple, or Orange, seldom Green or Brown, and almost never Black*.

The most common change of colour is into white, and this takes place from every other colour, but principally from red, blue, or purple. Blue and purple flowers frequently change to red, but it is seldom that a flower changes to yellow.

The following are some of the Anomalies of Colour that take place in plants;—

RED changes to WHITE, in

<i>Agrostemma coronaria.</i>	<i>Chironia Centaurium.</i>
<i>Antirrhinum majus.</i>	<i>Convolvulus arvensis.</i>
<i>Aster diffusus.</i>	<i>Coronilla varia.</i>
<i>Azalea nudiflora.</i>	<i>Daphne Mezereum.</i>
<i>Betonica officinalis.</i>	<i>Erythronium Dens-canis.</i>
<i>Camellia japonica.</i>	<i>Erica cinerea.</i>

* Willdenow says, that the yellow colour predominates in the compound flowers, and in most autumnal flowers; white is found chiefly in the spring flowers; white and blue principally in the flowers of cold regions; and red and richly variegated colours in those of warm climates.

RED changes to WHITE, in

<i>Erica comosa.</i>	<i>Pæonia corallina.</i>
<i>Erica tetralix.</i>	<i>Pedicularis palustris.</i>
<i>Erica vagans.</i>	<i>Pedicularis sylvatica.</i>
<i>Epilobium angustifolium.</i>	<i>Pelargonium zonale.</i>
<i>Epilobium hirsutum.</i>	<i>Phlox aristata.</i>
<i>Fumaria officinalis.</i>	<i>Polygonum orientale.</i>
<i>Geranium Robertianum.</i>	<i>Punica granatum.</i>
<i>Hibiscus Rosa-sinensis.</i>	<i>Rhododendron maximum.</i>
<i>Lychnis dioica.</i>	<i>Rosa damascena.</i>
<i>Lychnis flos-cuculi.</i>	<i>Rosa provincialis.</i>
<i>Lychnis vesicaria.</i>	<i>Sabattia stellaris.</i>
<i>Malva moschata.</i>	<i>Sedum telephium.</i>
<i>Mirabilis jalapa.</i>	<i>Silene armeria.</i>
<i>Nerium oleander.</i>	<i>Trifolium pratense.</i>
<i>Ononis fruticosa.</i>	<i>Valeriana rubra.</i>
<i>Ononis repens.</i>	<i>Vinca rosea.</i>
<i>Orchis mascula.</i>	

RED changes to BLUE, in

<i>Anagallis arvensis.</i>	<i>Hydrangea hortensis.</i>
<i>Rhododendron maximum.</i>	

RED changes to YELLOW, in

<i>Fritillaria imperialis.</i>	<i>Mirabilis jalapa.</i>
<i>Lilium pomponium.</i>	<i>Pitcairnia bracteata.</i>
<i>Tulipa Gesneriana.</i>	

RED changes to BUFF, in

Camellia japonica.

BLUE changes to WHITE, in

Anemone hepatica.	Pulmonaria paniculata.
Ajuga reptans.	Pulmonaria virginica.
Aster tradescanti.	Salvia azurea.
Aster tripolium.	Scilla campanulata.
Campanula rotundifolia.	Scilla nutans.
Campanula trachelium.	Scilla peruviana.
Cichorium intybus.	Soldanella alpina.
Centaurea cyaneus.	Syringa persica.
Houstonia cærulea.	Syringa vulgaris.
Hyssopus officinalis.	Veronica anagallis.
Jasione montana.	Veronica beccabunga.
Lavendula spica.	Veronica chamædrys.
Nigella damascena.	Veronica longifolia.
Polemonium cæruleum.	Veronica montana.

PURPLE, or VIOLET, changes to WHITE, in

Agrostemma githago.	Hibiscus purpureus.
Aquilegia vulgaris.	Hibiscus syriacus.
Aster dumosus.	Iberis ciliata.
Carduus acanthoides.	Iris pumila.
Carduus eriophorus.	Lamium purpureum.
Colchicum autumnale.	Lathyrus sativus.
Crocus vernus.	Lathyrus sylvaticus.
Cynoglossum officinale.	Ophrys apifera.
Digitallis purpurea.	Orchis conopsea.
Erica vulgaris.	Orchis morio.
Erodium cicutarium.	Orchis pyramidalis.
Euphrasia officinalis.	Phyteuma orbicularis.
Geranium pyrenaicum.	Primula farinosa.
Gentiana amarella.	Primula villosa.

PURPLE, or VIOLET, changes to WHITE, in

Prunella vulgaris.	Trillium erectum.
Scabiosa succisa.	Verbena officinalis.
Scabiosa columbaria.	Verbena hastata.
Scrophularia nodosa.	Vicia cracca.
Serratula tinctoria.	Vicia lathyroides.
Solanum dulcamara.	Vicia sepium.
Statice armeria.	Viola odorata.
Syringa vulgaris.	Viola canina.
Thymus acinos.	

BLUE or PURPLE changes to RED, in

Ajuga reptans.	Orchis morio.
Anemone hortensis.	Polygala vulgaris.
Anemone hepatica.	Pulmonaria maritima.
Aquilegia vulgaris.	Scabiosa succisa.
Centaurea cyanus.	Scabiosa columbaria.
Dahlia superflua.	Scilla nutans.
Hibiscus purpureus.	Scilla campanulata.
Hibiscus syriacus.	Scutellaria minor.
Hottonia palustris.	Statice armeria.
Hyacinthus botryoides.	Tradescantia virginica.
Hyssopus officinalis.	Trillium erectum.
Iris pumila.	Veronica anagallis.
Lathyrus sylvestris.	Veronica longifolia.
Monarda fistulosa.	Viola odorata.

BLUE or PURPLE changes to YELLOW, in

Anemone pulsatilla.	Iris pumila.
Crocus vernus.	Iris subbiflora.
Ethyronium dens-canis.	Zinnia multiflora.

YELLOW changes to WHITE, in

Antirrhinum Linaria.	Primula auricula.
Argemone mexicana.	Primula vulgaris.
Bellis perennis.	Pyrethrum parthenium.
Chrysanthemum indicum.	Ranunculus ficaria.
Cistus helianthemum.	Raphanus raphanistrum.
Coreopsis alternifolia.	Spartium scoparium.
Galium verum *.	Trifolium officinale.
Iris pseud-acorus.	Verbascum blattaria.

YELLOW changes to RED, BLUE, or PURPLE, in

Anthyllis vulneraria.	Primula auricula.
Chrysanthemum indicum.	Primula veris.
Cistus helianthemum.	Primula vulgaris.
Lilium canadense.	Symphitum officinale.
Lonicera dioica.	Vaccinium resinsum.

YELLOW changes to BUFF, COPPER COLOUR, or
BROWN, in

Chrysanthemum indicum.

WHITE changes to BLUE, or PURPLE, in

Anchusa angustifolia.	Heracleum sphondylium†.
Aster macrophyllus.	Lamium album.
Campanula pumila.	Lupinus villosus.
Convolvulus sepium.	Lychnis vespertina.
Erica vestita.	Sedum telephium.

* Bot. Guide.

† Indig. Bot.

WHITE changes to RED, in

Achillea millefolium.	Lamium album.
Anemone nemorosa.	Lupinus villosus.
Arbutus unedo.	Lychnis vespertina.
Bellis perennis.	Oxalis acetosella.
Convallaria majalis.	Polygala senega.
Cratægus oxyacantha.	Rosa spinosissima.
Dictamnus albus.	Rosa alpina.
Epacris pungens.	Spiræa ulmaria.
Erica vestita.	Veronica virginica.

WHITE changes to YELLOW, in

Asclepias vincetoxicum.	Narcissus orientalis.
Crocus vernus.	Papaver nudicaule.
Erica vestita.	Rosa spinosissima.
Erica tenuiflora.	

FROM the above instances it is evident, that every colour is liable to alteration, and this is not confined to a single change, an individual flower often assuming several colours. Thus many of the Iris tribe vary constantly in their hues. The Trident-petaled Iris (*Iris tricuspis**) is found with white, straw-coloured, yellow, pale blue, and blush-coloured petals; and the small Bulbous-rooted Iris, (*Iris xiphium*), with

* *Moræa tricuspis*.

white, yellow, purple, violet, and blue flowers. The Upright Larkspur, (*Delphinium ajacis*,) has blue, purple, violet, ash, silver-coloured, and striped flowers, and the well-known Sweet William and Carnation, (*Dianthus barbatus* and *caryophyllus*,) vary with red, flesh-coloured, white, variegated red and white, rose-coloured, purple, scarlet, yellow, spotted and bordered flowers *. The *Azalea calendulacea*, is remarkable for its numerous varieties of colour, and a species of *Azalea*, as it is supposed from the description, found by Mr. Bertram on the hills in West Georgia, in the lower Cherokee country, had the flowers of all shades, from a pale cream colour to the most splendid golden yellow, orange, or most perfect scarlet or flame colour; and all these colours were sometimes seen on

* Carnations are divided by Florists into four classes. FLAKES, such as have two colours only, the stripes large, and running quite through the petals. BIZARES, flowers striped or variegated with three or four different colours, in irregular spots or stripes. PIQUETTES, such as have a white ground spotted or pounced with scarlet, red, purple, or other colours; and PAINTED LADIES, with the petals of a red or purple colour on the upper side, and entirely white underneath.

separate branches of the same plant, as well as on different ones*.

But perhaps the plant that has the greatest variety in point of colour, is the Marvel of Peru, (*Mirabilis jalapa*,) the Belle de Nuit of the French, being found with white, yellow, buff, purple, and red flowers; or with mixed ones, as purple and white, purple and yellow, and red and yellow; and these in different or the same plants, some having the flowers all plain coloured, others all variegated, and some both plain and variegated.

An astonishing number of varieties of colour and its different combinations, have been produced in flowers, especially in the Pink, Carnation, Hyacinth, Anemone, Ranunculus, and Tulip,

“ and while they break

On the charm'd eye, th' exulting Florist marks

With secret pride the wonders of his hand.”

* A singular, partial change of colour takes place, in the Wild Carrot, the flowers being sometimes all white, at other times all white except the central floret, which is a deep crimson, and sometimes a few crimson florets appear in the middle of the umbel. Withering.

In a catalogue published a few years since in this country, we find above two hundred distinct varieties of the Anemone, three hundred of the Hyacinth, seven hundred of the Ranunculus, and above nine hundred varieties of the Tulip, and the Dutch catalogues present us with much more formidable lists. In these, we find red, blue, white, yellow, and green Hyacinths, with all the intermediate shades; red, yellow, and white Tulips, and these colours broken, with brown, cherry, rose, yellow, and violet colours; purple, grey, coffee-coloured, brown, crimson, red, rose, orange, yellow, white, olive, and green-coloured Ranunculuses, and each of these again variously intermixed.

IT OFTEN happens that the colour of a flower is only partially changed, as in the *Rosa gallica* var. *mundi*, and in the *Camellia japonica*, where the petals are red and white, and in the *Geranium pratense*, where they are blue and white. A beautiful variety of *Convolvulus purpureus*, is figured in the Botanical Magazine, in which

the flower is distinctly striped with blue and white. In the garden at Dalbeth, two plants of *Convolvulus tricolor*, appeared amongst the others, displaying this anomaly in a remarkable manner. Some of the flowers retained their natural appearance, others had broad patches of white and blue intermixed, and others were dotted or sprinkled with blue, whilst some were entirely white; all these varieties appearing upon the same plant, Plate IV. *a*, *b*, *c*. There is also a variety of the *Viola palustris*, with the blossoms striped with red, and of *Viola pedata*, with pale blue petals, tinged with dark purple.

VARIEGATED flowers are either striped, as in the above examples, or they are blotched or marbled, as in the *Rosa gallica*, *officinalis*, *spinosissima*, and *Eglantaria**, and a very singular variety of *Convolvulus tricolor*, found in a garden near Glasgow, figured in Plate IV. *d*, had irregular white blotches within the blue border of the corolla.

* *Rosa*, var. *flore marmorea*.



J. Hopkinson del.

These striped or blotched flowers, are for the most part, either the commencement of a change of colour, or an attempt in the flowers to return to their natural one; and it often requires all the skill of the Florist, to preserve their assumed hues, and prevent them from regaining their original appearance. The Scarlet Stock in a poor soil, very frequently becomes striped or blotched with white, and in some soils this takes place almost invariably; on the other hand, the striped variety of the *Geranium pratense*, is with difficulty retained in a garden, and has a constant tendency to assume its plain blue colour.

SOMETIMES one side only of the petal undergoes a change of colour, as in the Austrian Rose, (*Rosa bicolor*,) a variety of the Common Yellow Rose, which has the petals red on one side, and yellow on the other*, and a variety of the Scotch Rose,

* No doubt can be entertained of the Austrian being a variety of the Yellow Rose, as they are frequently met with on the same bush, and the *Rosa mundi*'s frequent appearance upon the *R. gallica*, readily betrays its origin. Many amusing and ridiculous accounts are given by old authors, of the change of colour in flowers, and the methods of effecting such

(*Rosa spinosissima*) is red on one side, whilst it retains its white colour on the other.

SINGLE coloured flowers sometimes change into two or more colours. A variety of the *Camellia japonica*, called the Snow-drop-flowered, has the petals white, edged with green; the *Antirrhinum orontium*, naturally of a rose colour, has the corolla changed to white, with violet and yellow lips, and a curious variety of Columbine has the nectary blue, and the apex yellow†. On the other hand, flowers with several colours, often become simple; the corolla of the common Bird's-foot, (*Ornithopus perpusillus*,) is variegated red, white, and yellow, but it sometimes becomes entirely yellow; and the flower of the Sweet Pea is found entirely white. In like manner, the Fig-

changes, but what shall we say to the following directions for procuring yellow single and double Roses, taken from a work published *within these few years* by a professed Florist!

"Take," says he, "an Hundred-leaf Rose, and ingraft it into a stock of Broom, there will arise from it a most beautiful Rose of a pure yellow colour. Two years afterwards, take a Maiden-blush Rose, and ingraft it upon the same Yellow Rose, and it will produce a real Double Yellow Rose, a rare thing in this country, and only found in the gardens of the curious!"

† Hort Kew.

wort, (*Scrophularia nodosa*,) which is greenish, with a purple lip, becomes entirely of a dull white.

COMPOUND flowers have often the yellow tubular florets in the centre entirely changed to white ones. But in a variety of *Pyrethrum parthenium*, the florets are only partially changed, having the under part of the tubular floret white, whilst the upper retains its yellow colour; these instances of change in colour might be multiplied without number.

The stamens and pestil more rarely vary in colour than the petals, but examples of this may also be found. The Columbine-leaved Meadow-rue, (*Thalictrum aquilegifolium*,) has the stamens yellow, white, or purple; the anthers of the Nodding Squill, (*Scilla amoena* var. *Siberia*,) are sometimes of a deep blue, and the stameniferous pestil of the *Arum maculatum*, varies from a yellowish green to a fine purple.

THE CAUSES of these variations in colour, are at present unknown, some peculiar

circumstances in the soil, or the different combinations with oxygen, with acids, or with alkalies, may tend to produce them, but we often find that in the same soil, and under the same management, one plant always retains its colour, whilst another will most readily acquire a new one.

Linnæus says, that the flower of the common Kidney Vetch, (*Anthyllis vulneraria*), is red or scarlet, when growing in a red clay soil, and white, in a white clay one *.

The *Anemone hepatica* is apt to change its colour in different soils. Mr. Bradley relates, that some roots of the Double Blue Hepatica, were sent to Mr. Harrison of Henley upon Thames, from Mr. Key's garden in Tothill Fields, whose soil was so different from the ground they were planted in at Henley, that when they came to blossom there, they produced white flowers, and were therefore returned back to their first station, when they regained the blue colour they had at first.

* This idea, (according to modern experiments,) does not seem to be correct.

The *Hydrangea*, when cultivated amongst Moss, generally becomes blue, and the *Lonicera periclymenum*, when growing in sand by the sea, has the corolla often entirely green *.

Variety of colour is sometimes produced by the accidental mixture of the farina of two different flowers with one another, and the produce, called Hybrids or Mules, partake of the colour of both.

Linnæus sprinkled the stigma of the Yellow Goat's-beard, (*Tragopogon pratensis*,) with the pollen of the Purple one, (*T. porrifolius*,) and the offspring had purple flowers with a yellow base. Sometimes a plant is produced between *Verbascum pulverulentum*, and *V. nigrum*, having the habit of the former, and flowers with purple stamens like the latter; and hybrid plants are produced between *Verbascum thapsus*, and *V. nigrum*, partaking of the appearance of both †.

* English Botany.

† All the *Verbasci* are apt to intermingle with each other, but the plants ensuing from these, as in most mule or hybrid plants, seldom perfect seeds, or if they do, the variety does not continue above one or two generations.

Koelreuter by fecundating the female flower of one species of *Nicotiana* with the pollen of another species of the same genus, produced a hybrid plant, retaining some of the characters of each of its parents, but resembling neither of them exactly*.

In general these Hybrids or Mules are sterile, though to this there are many exceptions, as *Sorbus hybrida*, *Pyrus hybrida*, and *Rhamnus hybridus*, and for these differences no cause can be assigned†.

IT IS BUT seldom that the varieties of colour in flowers, can be continued by sowing the seed, but there are instances where this takes place.

A white-flowered variety of *Geranium robertianum*, has sown itself plentifully in the garden at Dalbeth for some years past, and the produce has invariably been plants with white flowers. The *Anagallis cærulea*

* The *Primula vulgaris*, and *Primula veris*, readily intermix, and the produce always partakes of the character of both plants. Flor. Glott.

† For an account of Hybrid Plants, with the different theories in regard to them, reference may be had to the Amœn. Acad. Plantæ Hybridæ, Willdenow, and Messrs. Bradley & Knight's experiments on that subject.

is said always to produce plants with blue flowers, and even the striped variety of *Convolvulus purpureus*, according to the Botanical Magazine, is regularly produced from seed. Several other varieties of plants have the same faculty as the white *Vinca rosea*, the yellow and red *Zinnia multiflora*, and even the different varieties of *Convolvulus jalapa*, are pretty regular in this respect.

That these varieties of colour are produced very frequently by weakness, is evident from the circumstance of the variety being often much more tender than the original species. The white-flowered variety of the Virginian Spider-wort, (*Tradescantia virginica*), is with difficulty preserved in the open air during winter, whilst the blue is perfectly hardy; in like manner, the white Snapdragon is much more tender than the common *Antirrhinum majus*; and the same is the case in blotched or striped plants; but why this weakness or disease should in some species become so permanent, as to be propagated by seed, whilst in others, any attempt to

sow the seed, immediately restores them to their original appearance, is still a matter of surprise, and must remain undiscovered till farther advances in vegetable physiology shall throw some light on the subject.

SIMILAR CAUSES to those which produce the anomalies in the various parts of plants, produce the varieties of size, shape, and colour, in seeds or fruits. These, from the benefit we receive by their cultivation, are very familiar to us; and here the ingenuity of man more particularly shows itself, causing nature to deviate from her rules, and even to excel herself.

An abundant supply of nourishment generally increases the size of fruits, and frequently alters greatly their flavour. In the many excellent varieties of Apples, presented to us by the labours of the Horticulturist, we can scarcely recognise the small and austere Crab; and it is difficult to believe that the many exquisite and delicious Plums which adorn our gardens and

grace our tables, have their origin from the common Sloe *; whilst the Pear, which in its original state is small, hard, and tasteless, under the hands of the gardener becomes large, soft, and abounding with the most delicious juice.

A comparison of wild or natural fruits with those in our gardens, fully shows the wonderful effect which cultivation has in increasing the size and number of fruits; the first are few in number, and small in size, and in general without much perfume, and often sour; the others are numerous, large, perfumed, and juicy. These varieties, often the offspring of chance, are carefully preserved and propagated by the gardener, and the increase of the fruit, and the beauty of the shape and colour, is the recompense of his trouble.

As a change from a poor to a richer soil, is the most common cause of the increase in the size of fruits, so their return to their native soil, or even a too long continuance in the same soil, will induce them to return to their original size. The Raspberry,

* Transactions of the Horticultural Society of London.

if allowed to remain in the same situation above five or six years, has fruit small and insipid as in wild plants *.

THE degree of flavour in some instances, keeps pace with the increased size of the fruit, and in others, is hurt or destroyed. Melons increase greatly in size from plentiful watering, but the flavour is in that case decreased. In a dry season and soil, the Winter-thorn Pear, is sweet and highly perfumed; in a wet soil, it becomes perfectly insipid; and the St. Germain Pear, which in a dry soil is sweet, in a wet one becomes harsh and austere.

The difference of flavour in fruits is very great. Many varieties of Apples remain always sour and acrid, whilst others become exceedingly sweet, and the Bitter Sweet, a well known Apple, partakes in a singular manner of both flavours. The *Pomme Violet* takes its name from the juice having the flavour of Violets, and the flesh of a species of Strawberry, the

* The Black Currant is said to be found in its native place, betwixt Tobolsk and Tomsk, in Siberia, with berries as large as a Hazel Nut, probably owing to some particular richness in the soil.

Fragaria viridis of Weston, resembles the Nectarine in flavour.

BESIDES the innumerable variety that fruits assume in point of shape, and which it is needless to particularise, they sometimes become monstrous, as in double fruits, where two are unnaturally joined together; this happens in Apples, Pears, and Plums, more frequently in Cucumbers and Filberts, and there are instances of one Orange growing within another, in which case it has no seeds. Fruits are also disfigured by tumours or warts, produced by insects, and Mr. Keith mentions a curious anomaly which he met with in some Pears, which had several leaves growing out of them, half way down between the apex and base of the fruit.

A monstrous variety of the Lemon or Citron is cultivated in China, and occasionally in this country, called the Fingered Lemon. It has a solid fruit, without any cells or pulp, and is divided above the middle into five or more long, round parts, a little crooked, and having the appearance of the

human hand with the fingers a little bent; and a variety of the Orange, called the Horned Orange, somewhat similar to the above, spreading out into horns, is cultivated for its singularity, in the gardens of the curious.

ANOTHER anomaly in fruits, is when they want a kernel or stone; this is the case in several varieties of the Apple, which are always found without pips, and varieties of the Grape and of the Barberry, without stones, are very commonly cultivated; there is also a variety of Plum with the same deficiency. It has been said, that if fruit trees be deprived of the pith or medulla, they will produce fruit without stones; but that this is not the case, is evident from the pith in old fruit trees entirely disappearing, although they still continue to bear fruit with stones as formerly.

THE colour in fruits is as subject to vary as it is in flowers. The varieties of the Apple all proceeding originally from one species, are now almost innumerable, and amongst

them colour constitutes one great cause of difference. The Royal Wilding is entirely white, and the Pauson and Kentish Pippin green; others are greyish, as the Fenouillat, or the Pomme d'Anis; or brownish green, as the Russets. Some are entirely red or yellow, and others streaked with yellow, red, or green; and a variety brought from Petersburg, is so transparent, that the kernels may be perfectly seen when the Apple is held up to the light. Phillips, in a poem called Cyder, enumerates as follows some of the most esteemed Apples of his time:

“ The *Pippin* burnish'd o'er with gold, the *Moile*
Of sweetest honied taste, the fair *Pearmain*
Temper'd, like comliest nymph, with red and white.
Salopian acres flourish with a growth
Peculiar, styl'd the *Ottley*; be thou first
This Apple to transplant; if to the name
Its merit answers, no where shalt thou find
A wine more priz'd, or laudable of taste.
Nor does the *Eliot* least deserve thy care,
Nor *John-Apple*, whose wither'd rind, entrench'd
By many a furrow, aptly represents
Decrepid age; nor that from Harvey nam'd
Quick-relishing: why should we sing the *Thrift*,

Codling, or *Pomroy*, or of pimpled coat
The *Russet*, or the *Cat's-head's* weighty orb,
Enormous in its growth.
But how with equal numbers shall he match
The *Musk's* surpassing worth! that earliest gives
Sure hopes of racy wine, and in its youth,
Its tender non-age, loads the spreading boughs
With large and juicy offspring, that defies
The vernal nippings, and cold syderal blasts.
Yet, let he to the *Red-streak* yield, that once
Was of the sylvan kind, unciviliz'd,
Of no regard, till Scadamore's skilful kind
Improv'd her, and by courtly discipline
Taught her the savage nature to forget.

The Cassolete Pear is of an ash colour,
the Perfumed Pear of a deep red, spotted
with brown, and the Orange Musk is yellow,
spotted with brown.

MANY other fruits vary in colour, as well
as the Apple and Pear. The Cherry is
found with red, white, yellow, and black
fruit; and the Gooseberry with red, white,
yellow, and green. The fruit of the Bar-
berry is red, white, orange, purple, and
even black, and Forsyth amongst his va-
rieties of fruits, mentions a black Apricot.

The Strawberry varies from white to pink, light and dark red, and one variety is green; and the Cocoa Plum (*Chrysobalanus icaco*) has the fruit either white, yellow, red, purple, or variegated. It is seldom that fruits become variegated or striped, except in Apples or Pears, which frequently have the side next the sun differently coloured from the other; there are some varieties of fruits, however, which are always striped, as the Carnation Cherry, which is red and white; and Mr. Knight raised from the white Chasselas and the Aleppo Grape, a black Grape with white stripes; the same plant produced pale-blue and white, and colourless berries.

THE flesh or substance of the fruit occasionally varies in colour, as in Peaches, the flesh of some of which are white, others yellow, and several of a deep red. In like manner, the flesh of one variety of Melon is green, of another, red, and of a third, yellow; and the Choak Pear (*Poire d'Etrangillon*) has red flesh, whilst that of the Green Chisel is green.

These different varieties are almost always produced by accident, generally by sowing the seeds, and are only retained and propagated by grafting, budding, or by a separation of the parts*. Although fruits retain their anomalous appearances much more constantly than flowers, which generally show a tendency to resume their primitive form or colour, yet there are several singular instances of the same propensity being displayed in them. The Nectarine is well known to be only a variety of the Peach Tree, (*Amygdalus persica*,) with smooth fruit instead of rough; but it sometimes happens that Peaches and Nectarines appear naturally on the same tree; and Mr. Salisbury, in the Transactions of the Horticultural Society of London, relates an instance of the Nectarine and Peach being united in one individual, one half of the fruit being rough and the other smooth, and this was not occasioned by the pollen having been carried by the

* One variety of Apricot is an exception to this, viz. the *Abricot Alberge* of Duhamel, the seeds of which are said to produce the same fruit, or with very little variation.

wind, or by insects, as the young fruit had its anomalous appearance long before impregnation could have happened*.

Mr. Knight relates two instances, somewhat similar to the above, illustrative of the same anomaly. A tree of the Yellow Magnum Bonum Plum, which was forty years of age, and which had always borne fruit of the usual colour, had in 1814, upon one of its branches, red fruit in every respect similar to the Red Magnum Bonum Plum; and a May Duke Cherry Tree, had one branch which constantly produced oblong fruit, that ripened later than the produce of the other branches of the same tree. Neither of the above instances had sprung from bud or graft.

THAT cultivation and soil have great effect in causing fruits to ripen earlier, as well as improving their flavour and taste, cannot be doubted. Miller says, that if we examine the best French authors who

* Many new varieties, have however doubtless been introduced, by the mixture of the pollen of different plants, and the ingenious experiments of Mr. Knight, fully demonstrate the benefit that may be derived from this circumstance.

have written on the subject of fruit trees, we find that the time of ripening of many sorts of Pears, is put down a month or six weeks later, about fifty or sixty years ago, than they are now found to ripen about Paris, and in this country it is the same. In part no doubt, this may be owing to cultivation, which as it imparts in general more vigour to plants, may enable them to put forth their blossoms earlier than in their native state, but it is probably much assisted by grafting, as we know, that by grafting late fruits upon stocks of early kinds, the ripening of the fruit is rendered more early.

In a country like this, where the seasons are naturally so backward, the forcing and cultivating early fruits, cannot be too much attended to, for although we have not the climate under our command, experience has shown the possibility of our enabling plants to adapt themselves so much to our late seasons, as almost to do away the inconvenience arising from them.

IT HAS before been noticed, how much

the flavour of fruit is altered by soil and cultivation; the disposition of the roots has also great influence in this respect. If the roots are allowed to penetrate too deep into the earth, the sun and air are prevented from having access to them, and the fruit in consequence loses much of its flavour; this is peculiarly the case in stoned fruits. As the juices in the soil are exhausted by the tree, the oxygen of the atmosphere penetrates the earth, and extracting the carbon, forms for the roots new nourishment. Du Hamel remarked, that the lateral roots of plants were always more vigorous, the nearer they approached the surface.

Some trees, the roots of which naturally penetrate very far down in the earth, are supplied with oxygen in a very curious manner. The roots of the Deciduous Cypress Tree, (*Cupressus disticha*), push up at regular distances soft cones, without branches or leaves, which elevate themselves a little above the earth, and supply the deep roots with the oxygen necessary for them. The same thing is like-

wise observed in the *Avicenia nitida*. Formerly it was customary to place flag stones below the roots of trees, to prevent them striking too deep into the earth, and it is at present the practice amongst gardeners, to cut off the centre or tap root, and thus keep the roots near the surface.

Many other circumstances yet unknown, most likely tend to produce the innumerable varieties found in the appearance, flavour, and perfume of fruits; an attentive examination of these varieties, and of the different effects produced by different soils and modes of cultivation upon plants, may at some future period point out to us the causes which produce these effects, and enable us not only to retain and propagate them, but actually to produce them at our pleasure. The experiments already made, have gone far towards this purpose, and to none are we more indebted than to Mr. Knight, who has added so much to the advancement of Horticulture.

THE preceding enumeration of the ANOMALIES OF PLANTS, are such as are noticed by the authors I have had it in my power to consult, or have come under my own observation. Many others, or at least many modifications of those mentioned, will no doubt have occurred to those conversant with plants, for as the causes that produce them are numerous, so the varieties are innumerable.

“ Finem ludentis polymorphæ naturæ, vix attingat Botanicus, qui in varietatibus sese exercere velit.”

The preceding enumeration of the Anomalous or Plants, etc. such as are noticed by the author I have had it in my power to consult or have come under my own observation. Many others, or at least many modifications of those mentioned, will no doubt have occurred to those conversant with plants, for as the causes that produce them are numerous, so the varieties are innumerable.

Mr. Finem Jenkins polymorphus naturae, viz. attingat Botanica, qui in varietatibus esse excipere velit.

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